POPULAR Computing WEEKLY

21 October 1982 Vol 1 No 27

35p

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COMPUTER SWAP

SEE PAGE 24

New Spectrum tapes: Value for money guide

More Spectrum ellipses

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Cover Story:
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Hobhouse Court, 19 Whitcomb Street,
London WC2
Telephone: **01-839 6835**

Published by Sunshine Publications Ltd.

Typesetting, origination and printing by
Chesham Press, Chesham, Bucks

Distributed by S M Distribution
London SW9. 01-274 8611. Telex: 261643

Subscriptions
You can have *Popular Computing Weekly* sent to your home: the subscription rate is **£19.95** per year, for addresses in the UK, **£37.40** overseas.

How to submit articles
Articles which are submitted for publication should not be more than 1000 words long.

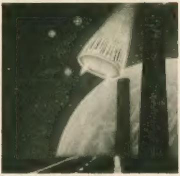
All submissions should be typed and a double space should be left between each line.

Programs should, whenever possible, be computer printed.

At present we cannot guarantee to return every submitted article, so please keep a copy.

Accuracy
Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

This Week



Cover illustration by Stuart Hughes.

Editorial

The Hunt committee report on cable tv, due to be published on Tuesday October 12, could change the face of British television.

The report is believed to favour the setting up of a cable network for all of Britain's major towns and cities. Given the go-ahead by the government, television viewers could be watching their first cable tv programmes within two to three years. As many as 30 different channels could be available, compared to the present three.

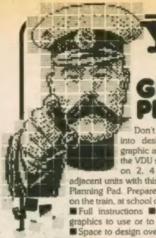
But, if the Hunt committee's report has serious implications for tv, it has no less serious implications for microcomputers. The linking up by cable of Britain's towns and cities would provide microcomputer users with unparalleled opportunities for the creation of their own networks.

Once a cable system has been established, it should not be difficult to cater for both tv and microcomputer users. The only real problem is the initial cost of laying the cable, but that is something the prospective cable tv operators should pay for.

With cable networks readily available, Prestel's Micronet 800 scheme could find it has competitors sooner than it first thought.

Next Week

Can you survive the perils of the haunted house? Find out in Hallowe'en — a new game for BBC.




PIMANIA

Acorn joins the classroom battle

ACORN Computers has announced its own discount scheme to assist the Department of Industry's efforts to encourage the use of microcomputers in schools.

This follows the launch of a similar scheme by Sinclair Research in September (see *Popular Computing Weekly*, September 30).

Under the Acorn offer, any school — primary or secondary, state or public — that buys a BBC Model B microcomputer will also receive a free Econet interface, value £46. The discount is valid for any purchase — under the DoI scheme or not — and for every machine purchased by a school. There is no limit on the number of machines per school to which the offer applies.

An Acorn spokesman explained: "Acorn believe Econet and schools go hand in hand. The BBC machine was designed for networking in the classroom."

The company hopes schools will buy one BBC micro plus disc interface (including the free Econet interface) at half price under the DoI offer, and then buy further machines with the free networking interface fitted. In this way the DoI machine will operate as the master file server and the others will be able to access its discs through the Econet system.

The Acorn scheme runs until the end of 1984. Acorn estimate that by then the offer will have been worth over £5m to the 32,000 eligible schools.

New range of business micros

A RANGE of small business microcomputers and software has been announced by a new company, Information and Technology Computer Services.

The Andromeda series includes 36 models, each supplied with a selection of software, costing between £595 and £3295.

ITCS director, David Lewis-Pryce said: "We offer a completely new approach — the user buys the software and gets the hardware on a free loan."

At the low-cost end of the range is the Alpha O. This unit consists of the Z80 processor, 63-key Qwerty board, and 125K disc drive. Also included are ITCS Word-processing and Data-management packages. The system costs £595 plus £120 per annum maintenance.

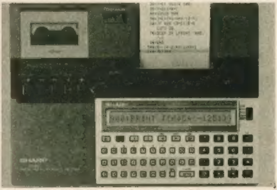
More expensive options include dual 125K disc drives and a 12-inch video monitor. These variants are accompanied by Financial Planning, Integrated Accounting and Communications software packs.

Said David Lewis-Pryce: "The Andromeda range has been launched with the intention of its becoming a serious contender as the world's leading microcomputer."

Extended Basic to put in your pocket

SHARP is to launch a new pocket-size microcomputer in time for Christmas.

Called the PC-1251, it is an improved version of the PC-1211. Despite its small size — 5 5/16 × 2¾ × ⅜ inch — the PC-1251 has 24K Rom and 4.2K Ram and runs a version of Basic extended from that on the PC-1211 including *Dim*, *Str$* and *Inkey$* commands.


Sharp PC 1251 with CE-125 printer/microcassette recorders.

The new machine features a Qwerty-style keyboard with separate numeric pad and a 24 character 5 × 7 dot matrix liquid-crystal display. It will work for up to 300 hours on one battery, and memory in Ram is protected by a battery back-up when the machine is not in use.

Also available, to connect to the new computer, is the CE-125 integrated printer/microcassette recorder. The PC-1251 clips into this unit which allows programs to be easily saved on to tape and gives a 24-character print-out from the unit's thermal printer. The CE-125 is powered by a rechargeable Ni–Cad battery.

The complete system — PC-1251 plus CE-125 — has the dimensions of an inch-thick A5 paperback book.

Available at the beginning of December, the PC-1251 will cost £79.95 including VAT.

Information Technology '82 doubles fund target

ONLY half the money donated to finance Information Technology Year '82 has been provided by the computer industry. Less than half that has come from UK companies.

The City and oil companies have provided the bulk of the funding. So far £1.5m has been supplied which has been matched by a promised government contribution making a total of £3m.

This figure is more than double the IT '82 target.

Clive has vision of the year 1990

CLIVE Sinclair has predicted the disintegration of manufacturing industries in the UK by 1990.

"The idea that we need a manufacturing industry to pay for the rest of our society is a fallacy," he said, speaking on the BBC 2 television programme, *Futures*, on October 7.


Clive Sinclair.

"The truth is that Britain is in the wrong part of the world to make conventional goods. By the 1990s we must turn from the products of the material to products of the mind. We are a particularly creative people and where others can produce, we can design. Hong Kong manufacturers are even now ready to employ our best freelance industrial designers. In the next decades China and India will become the great producing nations.

"I believe the next 15 years will be among the most momentous in our economic history — we are on the edge of the most sweeping and rapid changes we have ever seen," he said.

April '83 date for festival of computers

THE Association of London Computer Clubs plans to hold the capital's first Computer Festival next Spring.

The event, including open days, seminars, exhibitions and workshops, will be held from April 3 to 17. Central Hall will see an exhibition from April 14 to 16, and a conference is being organised at City University.

For further details contact Robin Bradbeer, Association of London Computer Clubs, The Polytechnic of North London, London N7.

POPULAR Computing WEEKLY

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Letters

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Copywriting English words

I saw an advertisement in the *Daily Telegraph*, September 27, which disturbs me very much. I am referring to Atari's alleged claim to the name *Defender* together with alleged rights concerning a video game of that name.

Let me explain what disturbs me. The word *Defender* is one that is in common English usage — particularly in the games of football and chess. I cannot for the life of me see how a common English word can suddenly be tied up in this way — if they had called it *Atari-defender* that would be very different.

I do not see how this name can be tied up even if linked to a game concept either. Where is the line to be drawn? Is *Protector* going to be an infringement? In which case maybe Atari are at fault since a book by Larry Niven is so titled and a game based on that book would surely be legitimate.

Secondly, I do not see why Atari should have what I consider to be the monumental cheek of demanding others to get in touch with them. Surely the onus is on Atari to get in touch with others if they consider that their copyright is being infringed. I think I could make out a good case for *their* publishing listings as part of the public claim to copyright. I suspect that, when put to the test, copyright in computer listings will turn out to be very similar to musical copyright, in which case Atari are attempting to stand on some non-existent legs! At any rate they are trying to establish some kind of precedent — and I believe that to allow them to do so will be very dangerous and costly indeed.

Finally, they *say* they were first with this game — but how do *we* know? And how much of what they are trying to tie up in this way is merely a *general concept* finding expression in a computer listing? It has something of the flavour of Wilkie Collins suing Charles Dickens because Collins wrote the first detective story, *The Moonstone Mystery*, and in *Bleak House* Dickens made use of the detective Inspector Bucket. In my view Atari are trying to tie down to copyright far too broad a concept and if they succed we shall all be the losers.

As an ordinary "consumer" I would urge those whose interest lies in developing games not to be put off — so long as they do not descend to plagiarism. I suspect we have some careful defining to do, and I suspect also that Atari's present position will be laughed out of court.

[illegible] J Redrup
The Vicarage
Kea
Truro
Cornwall TR3 6AE

Sticky fingering

I have had a ZX81 with 16K Ram pack since March. I cannot afford a proper keyboard yet, so I use Sellotape sticky fixers which I stick on to the pads to make a temporary keyboard. I find this is a great help, especially when playing games. I thought you might be interested to know this in case other people want to try it.

Nicholas Butterworth
18 Hillyfields
Dunstable
Bedfordshire LU6 3NS

Backchat and criticism

Your correspondence is getting very interesting, not to say controversial. I enjoyed the backchat from Messrs Wiseman and Meardon (issue 22).

In the same issue, Keith Driscoll's correction of the Sinclair manual refers to 'the' ZX81 manual. I would maintain that this is a well publicised item, long predating your publication. The earliest reference I can find is in an *Interface* book dated August 1981. I have however seen this mentioned in magazines quite regularly. If it's the only error in the manual worth mentioning, then it's some manual.

Items from the Spectrum manual may interest some readers. Page 114, bottom, gives extended mode numeral key values to pretty up listings. The *Chr$* values printed are wrong in two instances, and the actual *Chr$* values obtained are consistent with the table at the top of the same page. Thus, in extended mode:

```
9 GIVES CHR$ 19 (not 12) + CHR$ 1
CAPS SHIFT 9 GIVES CHR$ 18 (not
   19) + CHR$ 1
```

C J Hewish
13 Beacon Road
London SE13 6EQ

How on earth?

I was watching an ITV news bulletin on September 21 when on came an item about the Prime Minister's visit to Japan. It stated that Mrs Thatcher awarded the Japanese Premier an English-built computer, a Sinclair Spectrum. I would like to know when Mrs Thatcher ordered her Spectrum and how long it took for her to get it, because I have been waiting 18 weeks for mine.

Christopher Watson
33 Laneside Drive
Bramhall
Cheshire

Grainy offering

I hope he will forgive me for saying so, but I feel there is a better solution to John Grain's number reversal problem than that offered by Ian Beardsmore. John's letter implied that he wanted a variable to be reversed, and what he was offered is a *string* reversal. May I humbly suggest:

```
10 INPUT X
20 LET X$ = STR$ X
30 FOR J = LEN X$ TO 1 STEP -1
40 LET X$ = X$ + X$ (J)
50 NEXT J
60 LET X = VAL X$ (LEN X$ / 2 + 1
   TO)
70 PRINT X
```

This truly reverses the value of the variable entered and, by the way, offers an example of the much neglected reverse *Step* function available on the ZX81.

Nick Godwin
4 Hurkur Crescent
Eyemouth
Berwickshire
Scotland TD14 5AP

Jumping out of hibernation

I would like to thank all the people who have sent me details of 'bugs' in the Spectrum. In response to their interest, I would like to give the details of the latest 'bugs' to come out of hibernation.

1. The *Chr$ 8* error. The programmer has tested against the 'wrong limit' and hence backspacing *to* the top line is not possible. However, if on the top line backspacing is possible, but 'never never land' is reached when backspacing from location '0,0'.

2. The *Screen* error. The resultant string obtained by using *Screen$* is stored twice on the calculator stack — instead of once as it should be. Hence:

```
10 PRINT "12"
20 PRINT SCREEN$ (0,0) +
   SCREEN$ (0,1)
```

gives '22' instead of the expected '12'. The problem can be avoided by using temporary strings for each call to *Screen$*, or by avoiding the use of *Screen$* after a binary operator.

3. The *Str$* error. Have you tried:

`PRINT "A" + STR$0.1` which gives only '0.1'

or

`PRINT 1 + VAL STR$0.1` which gives only '0.1'

It appears that when the operand of *Str$* is between 'minus one' and 'plus one', but not zero, that an extra zero is put on the calculator stack. Hence there are more stacked results than stacked operations and the extra result is lost. Again, the problem can be avoided by using temporary strings or taking care after binary operators.

4. The *Close* error. There is no 'end-marker' at the end of the 'close stream look-up' tables so using *Close#4* before stream 4 has been opened leads one once again to 'never never land' and returning is problematical.

I suspect that there are further 'bugs' in the expression evaluation routines but these are not apparent in Basic as yet.

Ian Logan
24 Nurses Lane
Skellingthorpe
Lincoln LN6 5TT

If you have an opinion you want to express, or have spotted an error that needs correcting, write to: Letters, Popular Computing Weekly, *Hobhouse Court, 19 Whitcomb Street, London WC2.*

COVER STORY

Moon Landing

A new game for Vic20
by Czes Kosniowski

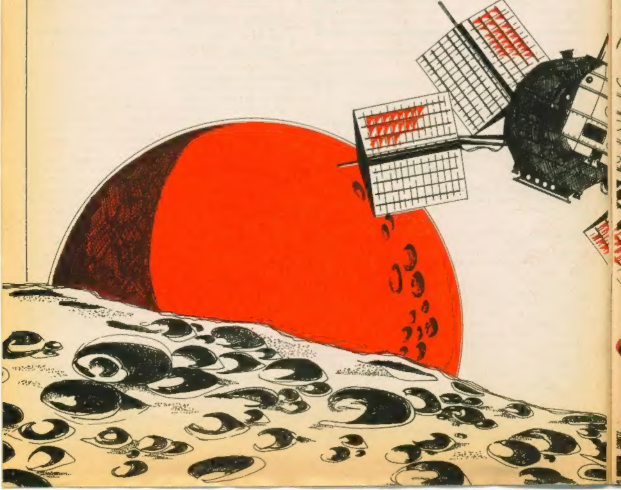
You are the commander of a lunar module. The module is in free fall, having detached itself from the mother ship. Your task is to soft-land the module on the moon's surface, using your retro-rocket (space bar) to slow your descent.

However, your fuel is limited, so you will have to exercise your judgement when determining your speed. Too fast and the module will explode. Too slow and you will run out of fuel, causing the module to crash.

This program will run on any Vic20, with or without any memory expansion. Line 80 takes care of the various changes that occur when 8K or more of memory is added.

The computer gives a visual display (with sound) of your velocity, height and the amount of fuel left. You must not exceed a speed of 100, otherwise your module explodes. Try and land at a velocity of under 10 — it's not easy the first few times, but it is possible.

Lines 60-90 these set up the initial variables.
Lines 100-260 set up the initial visual display.
Lines 190 and 200 are the various *Poke* numbers needed for the visual display.
Lines 270-400 are the main loop of the game.
Lines 410-660 contain various print outs and displays for the end of the game.
Lines 670-790 are subroutines for the ending.
Lines 800-900 plot the fuel and display the fuel counter.
Lines 910-950 plot velocity and height.
Lines 960-990 display the velocity and height counters.



```
10 REM ******************
20 REM * MOON LANDING   *
30 REM *      BY        *
40 REM *CZES KOSNIOWSKI*
50 REM ******************
60 REM SETTING UP
70 POKE36879,24:R5=PEEK(36866)
80 Q=PEEK(44)>=18:VV=8146+Q*3584:QQ=38866+Q*512
90 S5=36878:S4=S5-1:S3=S5-2:S2=S5-3
100 PRINT"[CLR][BLU]VELOCITY*HEIGHT*FUEL   "
110 PRINT"[7CD]MAX_","100","[4CD] 50_"
120 HH=VV+7:FF=HH+7
130 PRINT"[HOME][CD]"
140 FORI=0TO19
150 PRINT"[4CR][RED]       [BLU][RVS] [OFF]       [ORN][RVS] [OFF][BLU]   ";
160 NEXTI
170 PRINT"[RED]       [BLU]       [ORN]       [HOME]"
180 POKEQQ,4:POKEVV,160
190 W(0)=96:W(1)=100:W(2)=111:W(3)=121
200 W(4)=98:W(5)=248:W(6)=247:W(7)=227
210 V=8+8*RND(1)
220 F=160:H=160:A=.9:B=1.8:FU=.3+.4*RND(1)
230 POKEFF+21,46
240 POKEFF+22,57
250 POKEFF+23,57
260 POKES5,15:POKES4,135:POKES3,130
270 REM START OF GAME
280 IFPEEK(197)=32THENGOSUB800
290 V=V+A
300 POKES4,128+INT(V*127/200)
310 POKES3,128+INT(V*127/200)
320 IFV<=0THENPOKES2,128-INT(V)
330 POKEVV+20,44-SGN(V)
340 X=VV+21:Y=ABS(V):GOSUB910
350 X=HH+20:Y=H:GOSUB910
360 POKEX+3,48+INT(H*10)-10*INT(H)
370 X=INT(V/8):Y=INT(V-8*X):Z=VV:GOSUB960
380 H=H-V*.01
390 X=INT(H/8):Y=INT(H-8*X):Z=HH:GOSUB960
400 IFH>=0ANDV<=100THEN270
410 REM END OF GAME
420 PRINT"[HOME][3CD][BLU]    VELOCITY =";INT(V)
430 IFV>100THENPRINT"[BLU]YOU WENT TOO FAST AND   ".."    EXPLODED"
440 IFV<=100ANDV>23THENPRINT"[BLU]   CRASH LANDING"
450 IFV<=20ANDV>10THENPRINT"[CD]NOT BAD : BUT":ONINT(5*RND(1))+1GOSUB740,760,770
,780,790
460 IFV<=10THENPRINT"[CD] [BLU]    WELL DONE"
470 POKES3,0:POKES4,220
480 FORL=15TO0STEP-1
490 POKES5,L
500 FORI=1TO50:NEXTI
510 NEXTL
520 POKES5,15
530 FORL=0TO17:GOSUB670:NEXTL
540 POKE36867,130
550 FORI=0TO200:NEXTI
560 FORL=17TO0STEP-1:GOSUB670:NEXTL
570 POKE36866,R5
580 FORI=0TO200:NEXTI
590 POKES4,0:POKES5,0
600 FORI=1TO1000:NEXTI
610 PRINT"[CD][PUR]  ANOTHER GO? Y OR N   [BLU]"
620 POKE198,0
630 GETQ$:IFQ$=""THEN630
640 IFQ$<>"N"THENGOTO60
650 PRINT"[CLR][BLU][5CD]   OK   BYE FOR NOW[4CD]"
660 END
670 REM PART OF END
680 POKES4,230+L
690 POKE36864,12+L
700 POKE36865,30+2*L
710 POKE36866,R5-L
720 POKE36867,174-L*2
730 RETURN
740 REM PART OF END
750 PRINT"YOU HAD A LUCKY ESCAPE":RETURN
760 PRINT" YOUR CRAFT IS RUINED":RETURN
770 PRINT"THE IMPACT BROKE YOUR          LEGS          ":RETURN
780 PRINT"YOU'RE RUINED FOR LIFE":RETURN
790 PRINT"YOUR LICENSE HAS BEEN          REVOKED          "
800 REM FUEL PLOT AND COUNTER
810 IFF<1.5THENRETURN
820 F=F-FU
830 F1=INT(F/8)
840 F2=INT(F-8*F1)
850 IFF1>=0THENPOKEFF-F1*22,W(F2)
860 IFF1>=0THENPOKEFF-F1*22-22,96
870 POKEFF+22,48+INT(F/16.81)
880 POKEFF+23,48+INT(F/1.681)-10*INT(F/16.81)
890 V=V-B
900 RETURN
910 REM VELOCITY AND HEIGHT PLOT
920 POKEX,48+INT(Y/100)
930 POKEX+1,48+INT(Y/10)-10*INT(Y/100)
940 POKEX+2,48+INT(Y)-10*INT(Y/10)
950 RETURN
960 REM VELOCITY AND HEIGHT COUNTER
970 IFX>=0THEN POKEZ-X*22,W(Y)
980 IFX>0ANDX<=20THENPOKEZ-X*22+22,160
990 IFX<19ANDX>=0THENPOKEZ-X*22-22,96
1000 RETURN

READY.
```

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Command performance at 16

***David Kelly** talks to David Simons – the Commodore kid – about Simons' Basic*

When David Simons presented his Vic20 Basic enhancement package to Commodore, they jumped ■ it. They called off ■ team working in the US to produce a similar package for the new Commodore 64. David was commissioned instead.

He is 16 years old and has been programming since his father brought home an 8K 2001 Pet — what he calls Arthur C Clarke's version — in 1978. At first, David was interested in games but he soon began modifying the cassettes he bought to make them better.

"That's how I got to know Basic. The first game I wrote was a version of Monopoly which did everything except mortgages — with only 8K I ran out of memory. I got into machine-code using a Rockwell book for the Aim-65 and then had one or two things published in the *American Pet Magazine* and in the Commodore house magazine."

In the October 1980 issue of *Commodore Club News* David had a program — *Super Basic* — published which extended the Pet Basic to give it some of the facilities of the Apple, including shape tables and pseudo high-resolution.

Demonstration program

Shortly before the Vic20 was launched, David was asked to write part of a dealer demonstration program to accompany the machine. Although the work was never used, David also developed a Basic enhancement package for the Vic20. It defines, in 8K, a range of new commands which can be called from the keyboard. "It was much more exciting to use than the Pet" he explains. "Everything in the Basic is vectored, making it possible to have proper tokenised key-words. To do the same thing on the Pet would have involved rewriting whole chunks of the Basic."

When he finished the software package, he presented it to Commodore in Slough. They took it on with the intention of marketing it for the Vic. However, by March the Commodore 64 was appearing on the horizon.

Plans for Commodore to produce an extended Basic Rom cartridge for the new machine were shelved and David was commissioned to convert his 8K Vic Basic for use on the Commodore 64.

At this point 'O' levels interrupted the proceedings. ■ was June before David could get down to converting the program, using a Commodore 64 prototype supplied by the company.

The package is now finished. David has done rather more than a simple conversion — the package now occupies 16K of code.

Simons' Basic, as it has been dubbed, can be broadly divided into three parts according to the areas of the 64 Basic which it enhances. High resolution graphics and sound which at present have to be initiated by machine-code *Pokes*, are both covered by Simons' Basic.

The package also sets up structured programming commands such as *Procedures, If-Then-Else* and toolkit type commands. In all, Simons' Basic adds 110 new commands to the Basic on the 64 machine.

An advantage of David's package is that, even when the system is ■ use, 30K of programming space always remains available ■ the user. This is because of the way ■ ■ banked in the memory over the Basic already there. The standard Basic is banked in and out when an enhanced command ■ called and used. The 8K of high-resolution screen is dumped in the 8K of memory held behind the kernal.

David Simons with his Commodore 64 machine on which he developed Simon's BASIC. During his three months' work the machine received a tremendous battering at his hands. The package is now complete, but work does not stop here. David is shortly to start work on a multi-tasking program.

Among the sophisticated graphics commands is one to let you design your own 24 × 21 pixel characters (called a Mob). The *Mob Set* command gives you a 24 × 21 *character* array in which to build the design.

Each pixel is set by ■ character in the array between A and D. A defines the background colour and B, C and ■ define the Mob colour — any one Mob can only display three colours. Up to 256 Mobs can be defined at any time, but only eight can be shown together on any one screen pixel line (switching will gets around this).

Other graphics commands include *Circle, Paint, Draw, Trace,* and *Arc. Angl* produces sectors of a circle for pie-chart applications and *Shade* colours them in.

Shape allows you to define a lineshape. The instruction ■ held as a string and different numbers plot left, right, up and down (eg "88887777" plots an 'L'-shape). The *Rot* command can then be used to rotate the defined shape around any given point.

Simons' Basic simplifies the music commands on the Commodore 64. All the *Poke* statements in the 64 Basic are replaced by the *Music* command which sets the notes as A to G with shift for sharps, octave number and duration. The *Envelope* command chooses the type of sound.

The completed expansion package was handed over to Commodore on September 2. They are now checking it through before they commit it to Rom, but the cartridge could possibly become available before Christmas. For each of the £50 packs sold, David will get a five percent royalty, so he stands to become quite wealthy. David is already starting work on a Commodore ■ multi-tasking program for ICI and, if Simons' Basic goes well, ■ may well end up expanding it once again for use on the Commodore 510.

Of the 64 machine he says "At times it is complex to use. What my package does is to make some of its sophisticated capabilities easier to work with."

The nine weeks it took him to write the package were quite busy. "I'd do some work on it most nights" he said "but if I had a lot of homework then I wouldn't make much progress. Most of my weekends though, were spent developing it. The main problem was the difficulty, with a program of this size, in seeing what I was creating. Listing the code out on the printer takes more than seven hours."

Croydon Computer Fair

Croydon Home Computer Fair was held at the Greyhound Halls, Croydon on Saturday, September 25.

Only about 2,000 people attended the show, put on in this ample post-war dance hall. Forty-two companies exhibited.

Ron Vogt, the show's organiser, admitted that the gate was less than he had hoped for: "We will be holding the event every year, but it takes time to become established — I just wish it didn't."

From the elephants' graveyard

***John Scriven** takes a look at the latest Spectrum software.*

Although the Spectrum has only been available since July, and many people are still waiting for their box of goodies from Cambridge, it is clear that the software writers have been busy with their new machines. At the last London Microfair, there were over 50 different programs available for Sinclair's latest offering.

The programs in this review can be divided into adventure games, mazes, arcade simulations, gambling games and utility programs. Reviewing games software is never easy — what appeals to one person does not necessarily appeal to someone else. The criteria employed here, are ease of loading, clear explanation, mug-trapping, value for money and that rather subjective area, entertainment value.

There was only one adventure program, *Elephants' Graveyard* (Silicon Software). You have to buy equipment for a trip into the jungle, set off with your recently-hired bearers and negotiate various problems until you eventually reach the fabled pile of ivory.

Technically, this is based on Kingdom rather than Adventure, in that there is a formula that determines the outcome. Once you have found an ideal number of bearers, food packs, guns, etc, you stand a greater chance of success. The random element [illegible] supplied by the number of misfortunes that occur en route.

This appears to be a direct copy of an earlier ZX81 program and does not use the sound and graphics to any high degree, although the game itself is fairly entertaining. On the reverse of the tape is a rather weak stocking-filler, *Sales*, which has the original but rather boring theme of selling ice-creams during changeable weather

Next, the maze programs. *Green Warrior* (JWV Software) produces random mazes from 32 × 8 up to an enormous size in excess of 32 [illegible] 100. The print-out option [illegible] useful to cope with this rather difficult task.

You are limited to the number of moves your little green warrior can take and this is where a small bug lies. If you fail to get round in the available moves, the same maze is redrawn. If it's particularly convoluted, it may be impossible to succeed [illegible] the permitted number of moves. You may have to break out of the program to restart the game. The maze-drawing algorithm itself, though slow, is good and will not leave you totally surrounded by hedge.

Macronics supplies *Dragon Maze*, an ingenious program that shows the whole maze only at the beginning. As you start to move, the route disappears and is revealed as you explore. Instead of a Minotaur, there is a Dragon who pursues you if you approach his corner. This is an entertaining game and uses sound and graphics well.

One of the best arcade simulations on offer is *Meteor Storm* from Quicksilva. It is written totally in machine code and is practically identical to the arcade game, *Asteroids*. It even has what is described on the insert as 'speech' and certainly the loudspeaker gives a grating rasp that might be interpreted as '*Meteor Storm*'. On the first occasion I played this game I thought [illegible] said '*Peaches and Cream*' — you may decode it differently.

If you like high speed action games then you will be delighted with this opportunity to smash meteors, avoid flying saucers and hyperspace yourself over half the known universe. In some areas it surpasses the arcade original — you can 'hold' the game temporarily while you put the cat out or cook the dinner.

Several firms sell versions of *Startrek* It is surprising that a game as long in the tooth as this one [illegible] still worth marketing. I can remember playing it [illegible] the mid-seventies at an IBM open day and the features haven't changed much. There are still the short and long range scans, energy shields, phasors and the dreaded Klingons to be zapped.

JWV Software has extended its version to cover a larger slice of the universe. different levels [illegible] play and something mysteriously called in the manual 'Romulon sabatures'. Mr Spock never was too hot on spelling.

The manual [illegible] a useful accessory, and the game entertaining if you haven't played it too much before. [illegible] doesn't involve high-speed finger-jabbing nor even painful mental exercise — perhaps it's the ideal game when you come home from the second *Startrek* movie.

Star Dreams also provides a version that is not as involved as JWV's game but is still enjoyable to play. The advantage here is that you get another game on the reverse of the tape — *Towers of Brahma*. This is a mental problem rather than a game and consists of three posts, each one capable of supporting different sized rings. The rings are on post 1 and have to be transferred to post 3. Only one ring may be moved at a time and no ring may cover one of a smaller size.

The instructions are clear and the graphics reasonable, if not amazing. You can attempt to achieve success in the minimum number of moves or to better your time These two games make this cassette good value.

Torpedo Shoot (JWV Software) is similar to an early arcade game that relies on judgement rather than speed. There is [illegible] star-filled sky and a view of a stormy sea, traversed by various vessels. The object is to fire 20 torpedoes at the ships. Your base [illegible] fixed and cannot [illegible] aimed, which soon results [illegible] frustration and boredom

The graphics are good until a ship is hit, when they become rather strange, with large coloured blocks rising from the ship. If this feature were improved, it would be an average, if weak game.

STUDY THE MAZE

Star Quest (Macronics) is three mini-games in one. It involves avoiding meteors, docking a capsule and shooting retreating aliens. There is no variation in skill level and it seemed rather easy. A hardened '*Defender*' addict would not be impressed with this. If there were more mini-games and possibly a points system, then the game would be improved greatly.

Macronics also produces [illegible] game called *Space Rescue* that proved extremely difficult to load. I was surprised at this as it was the first Spectrum cassette I have encountered that refused to load on my usual two machines. The levels seemed satisfactory, but possibly the speed of recording was

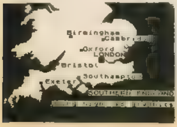
to the Towers of Brahma

not standard, as the only successful load was from a vari-speed deck. This seems to be one of the few ways to fool the improved loading system on the Spectrum.

Space Rescue itself is an arcade-type game that involves rescuing people from the surface of a planet and transferring them to a mother ship. There is a sideways-scrolling asteroid belt that has to be negotiated between the two. This is a much more professional game than *Star Quest* and would be good value if the loading were improved.

Four-in-a-row from JWV Software is like *Connect-4* and can be played against a partner or against the computer. You drop coloured discs into an 8 × 8 frame in turns and attempt to be the first to get four of your discs in a row, horizontally, vertically or diagonally. A younger player complained that it took too long to drop the discs, but in other respects it is well-written and makes a quiet change from Alien-stomping.

The final action game is *Bomber* from Control Technology. This is a Spectrum version of the old favourite *Blitz*, which necessitates flattening a city of skyscrapers by bombing them from your aircraft which is losing height. Should you succeed before crashing into a building, another city rises from the ashes somewhat higher than before.



Video Software's SUPERDRAW

Personally, I do not enjoy games where the sole object is to zap innocent civilians, although I may be oversensitive. At least Control Technology has not cashed in on recent events like some firms and given the city a Latin American name.

I am surprised after seeing so many published listings that this game is still a marketable product. It is not a particularly long program, though this is a competent enough version and does have the advantage of on-screen scoring. The main fault is that the first city is often too high to destroy and even seasoned arcade players need to get warmed up.

Bomber is another cassette that is better value as it contains another game on the reverse side. Since it is a gambling game, it serves to introduce the next group of programs.

Fruit Machine (Control Technology) is well-written and introduced and does all you would expect, except pay out real money. You have £5 to start, each spin costs 10p, and there are many combinations to win. There is a 'hold' facility and occasionally you can even 'nudge' the reels. The only lack of realism was its allowing me to walk away with £12 profit, a most unlikely result in real life.

Jack Gibbons produces a cassette called *Casino 1*, that contains three different games for hardened gamblers: *Blackjack*, *Craps* and *Roulette*. *Blackjack* is the totally

continued on page 22

Firm	Program		Cost	Value (1-10)
JWV Software 139 Allington Drive Strood Kent	*Green Warrior*	(48K)	£5.00	7
	Picture Maker	(48K)	£4.00	2
	Star Trek	(48K)	£7.00	8
	Torpedo Shoot	(16K)	£4.00	4
	4-in-a-row	(16K)	£4.00	7
Macronics 26 Spiers Close Knowle Solihull West Midlands	*Dragon Maze*	(16K)	£4.95	7
	Star Quest	(16K)	£3.95	4
	Space Rescue	(48K)	£4.95 or £12.00 for the three	[illegible]
Jack Gibbons 14 Avalon Road Orpington Kent	*Blackjack* *Craps* *Roulette*	(16K) (16K) (16K)	£4.00	9
Star Dreams 9 Bainbridge Close Seaford Sussex	*Star Trek* *Towers of Brahma*	(48K) (16K)	—	8
Quicksilva 92 Northam Road Southampton	*Meteor Storm*	(16K)	£5.95	9
Control Technology 39 Gloucester Road Gee Cross Hyde Cheshire	*Bomber* *Fruit Machine*	(16K) (16K)	£5.00	8
ZedXtra Software 5 School Lane Kinson Bournemouth	*Character Programmer*	(16K)	£4.95	5
Silicon Software Ltd [illegible] Short Lane Stanwell Middlesex	*Elephants Graveyard* *Sales*	(16K) (16K)	£2.95	6
Video Software Ltd Stone Lane Kinver Stourbridge West Midlands	*Superdraw*	(16K)	£5.00	[illegible]

Open Forum

Open Forum is for you to publish your programs and ideas.
It is important that your programs are bug free before you send them in. We cannot test all of them.
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How to contribute

Each week the editor goes through all the programs that you send to Open Forum in order to find the Program of the Week.

The author of that program will qualify for DOUBLE the usual fee we pay for published programs.
(The usual fee [illegible] £5.)

Presentation hints

Programs which are most likely to be considered for the Program of the Week will be computer printed and accompanied by a cassette.

The program will be well documented, the documentation being typed with a double spacing between each line.

The documentation should start with a general description of the program and then give some detail of how the program has been constructed and of its special features.

Listings taken from a ZX Printer should be cut into convenient lengths and carefully stuck down on to white paper, avoiding any creasing.

Please enclose a stamped, self-addressed envelope.

Code Loader

on ZX81

Before you groan inwardly and turn rapidly to the next page with a mumbled "Oh no, not another one!" let me assure you that this one really is a big improvement on the ones you may have seen before.

Nearly [illegible] the loaders I have come across that store the data in the first line in a *Rem* statement require you to previously type in as many characters of rubbish as there are bytes of machine code. The loader then pokes the code you type in into this statement. This makes it very difficult to check and correct the program.

This program gets around this problem by 'reading' the machine code instructions in the first *Rem* statement, converting these into character codes and poking the converted codes back into the same statement.

To use the program, type all the lines except 10 and 20. Into line 10 type your machine code separated by commas or spaces in decimal. If you prefer to type in Hex, change the ' *10' in line 90 to ' *16 '. Check and edit the code as required.

When you are satisfied it is correct use *Edit* to copy it into line 20. Then run the program. If required, save the program at this point. To run the machine code program use the instruction *Rand Usr* (16514). If the program is incorrect just copy line 20 into Line 10 and correct it.

The program uses the fact that the character code for numbers 0 [illegible] 9 and characters A to F are in sequence and lie between 28 and 43 (lines 80 & 90). Line 150 checks for an 'end of line' character.

```
BEFORE RUNNING THE PROGRAM...
  10 REM 33 130 64 17 0 32 1 0 1
 201
  20 REM 33 130 64 17 0 32 1 0 1
 201
  30 LET C=0
  40 LET L=16514
  50 LET P=L
  60 LET B=PEEK L
  70 LET L=L+1
  80 IF B<28 OR B>43 THEN GOTO 1
20
  90 LET C=C*10+B-28
 100 GOTO 60
 120 POKE P,C
 130 LET P=P+1
 140 LET C=0
 150 IF B<>118 THEN GOTO 60
 160 LIST


...AFTER RUNNING THE PROGRAM WE
GET


  10 REM [illegible]RND: 4 *TAN  7 0 32
1 0 1 201
  20 REM 33 130 64 17 0 32 1 0 1
 201
  30 LET C=0
  40 LET L=16514
  50 LET P=L
  60 LET B=PEEK L
  70 LET L=L+1
  80 IF B<28 OR B>43 THEN GOTO 1
20
  90 LET C=C*10+B-28
 100 GOTO 60
 120 POKE P,C
 130 LET P=P+1
 140 LET C=0
 150 IF B<>118 THEN GOTO 60
 160 LIST
```

Code Loader
by Nigel Vandyk

Spelling

on ZX81

This program runs on a 16K ZX81 and could easily run on a Spectrum with the minimum of changes. It was written for a remedial group at a primary school and has proved quite successful.

The user is asked to input ten words, up to fifteen letters long and then find somebody to try them out on. The child has two goes to get the word right then the incorrect word is placed next to the right word at the end of the test. You also can choose a speed in which the child has to pit its wits against.

The word [illegible] flashed on the screen for the defined amount of time. The program then starts again at line 60.

Program notes

10 = variable
60 to 68 = inputs name and speed
80 to 89 = sets up screen
92 to 180 = tests child and checks for correct answer.
181 to 185 = gives child another go if necessary.
220 to 247 = prints score and copies it on to printer.
300 to 317 = inputs words for testing.

```
   1 REM *COPYWRITE BRUCE POPLE*
   2 REM *SPELLING TEST 10-9-82*
  10 LET A=0
  50 GOSUB 300
  60 PRINT "WHAT IS YOUR NAME?"
  61 REM *GO AND GET A TEACHER*
  65 INPUT N$
  66 PRINT AT 6,11,"TYPE IN SPEE
D,"  "1 IS [illegible]    "5 IS QUITE
 FAST"  "10 IS SLOW"
  67 PRINT AT 0,0;""
  68 INPUT I
  70 LET A=0
  71 CLS
  79 PRINT "HELLO ";N$,,"LOOK
AT THIS WORD,THEN SPELL IT YOURS
ELF"
  80 PAUSE 300
  81 FOR N=1 TO 3
  82 SCROLL
  83 NEXT N
  85 CLS
  86 PRINT
  89 CLS
  92 LET I=I+15
  93 REM *GO AND GET A TEACHER*
 110 DIM B$(15,14)
 120 FOR N=1 TO 10
 121 LET V=0
 130 CLS
 133 PRINT A$(N)
 140 FOR M=1 TO I
 150 NEXT M
 160 CLS
 170 INPUT B$(N)
 180 IF B$(N)=A$(N) THEN GOTO 20
0
 181 LET V=V+1
 182 IF V=1 THEN PRINT "BAD LUCK
 ";N$,"TRY AGAIN"
 183 IF V=1 THEN PAUSE 200
 184 IF V=1 THEN GOTO 130
 185 NEXT N
 186 REM *GO AND GET A TEACHER*
 187 GOTO 220
 200 LET B$(N)="CORRECT"
 215 NEXT N
 220 CLS
 221 PRINT
 222 PRINT "THIS WAS YOUR SCORE
 ";N$
 223 PRINT
 230 FOR N=1 TO 10
 240 PRINT A$(N);" =";B$(N)
 244 NEXT N
 245 COPY
 246 INPUT U$
 247 CLS
 250 GOTO 60
 300 PRINT "INPUT 10 WORDS WITH
THE MAXIMUM  OF 14 LETTERS FOR T
HE PUPILS"
 302 DIM A$(15,14)
 304 FOR N=1 TO 10
 306 INPUT A$(N)
 308 NEXT N
 311 PRINT
 312 FOR N=1 TO 10
 313 PRINT A$(N)
 314 NEXT N
 315 PAUSE 200
 316 CLS
 317 GOTO 60
```

Spelling
by Bruce Pople

Open Forum

Vanishing Code

on ZX81

This describes a programming hint for the deletion of large quantities of Basic code on the ZX81.

I was faced with the task of either entering a very large machine code storage *Rem* or loading a very big program that contained the *Rem* and deleting all the Basic. I decided on the latter, and set out to find a way of deleting all the Basic at a single stroke. It proved extremely simple.

I found that all Basic lines end in a byte 118 followed by a zero byte and that the program ends with two 118 bytes. If one develops a method of determining which byte to poke with 118 following a previous 118, the effect is to delete all the code that followed. The two lines of Basic below will allow one to do this.

Line 100 is an all-purpose line that may be placed anywhere in the program. When this is RUN, the code immediately following the line is deleted TO THE END OF THE CODE

Line 100 computes the NXTLIN address & pokes 118 into it, which is adjacent to the byte 118 at the end of the previous line of code.

Line 200 may be entered as a direct command to delete ALL code except the first line. This is the line I used to delete my huge Basic program, leaving me with the machine code I wanted to 'borrow' and no aching fingers or boggle eyes.

```
 100 POKE (PEEK 16425+256*PEEK 1
6426),118
 200 POKE (16509+(PEEK 16511+256
*PEEK 16510)+4),118
```

Vanishing Code
by Paul Newman

Martians

on Vic-20

This is an arcade game with a difference. You, a Martian, are seeking revenge on those nasty humanoids who used to shoot you down in pubs and clubs. You have four lives, and if you shoot down all the men, the game starts again, but you have less chance of survival. Be careful not to shoot an arm, or you lose points!

The game fits in 3.5K, with room for small adjustments if you wish. Full instructions are included in the program.

The main program variables are:

RN define how often the men fire at you.
SC your score (10 points per man).
KY the keyboard buffer peek (197).
SP your base position (starts at zero).
FG equals one, when you are firing.
GF equals one, when the men are firing.
LL lives left (you have four per game).
PE men left to shoot.

The program uses a keyboard *Peek* rather than a *Get* statement as it is faster and allows for repeats.

Program notes.

1: *Goto* subroutine to print instructions.
10. Set screen colour, volume, and clear keyboard buffer
20: Define variables.
30-100: Set up screen, shields, men and your base.
105-109. Test to see if you are firing, or the men are, and adjust screen accordingly
110-130: Check for keys
140: *Goto* line 160 to let men shoot.
160-180. Define bullet starting position from men.
1000-1060: Clear base of screen, and minus one life. If all lives gone, then print 'game over' and restart.
2000-2010: Define bullet starting position from your base.
3000-3030: Wipe man off screen, after moving his arms, and adjust score. If no man left, then start again, with increased difficulty.
4000-4040: Print 'game over' routine and restart.
6000. Adjust difficulty of game and restart.
10000-11400: Instructions etc.

Peculiar Program

on Spectrum

This program demonstrates a very odd feature of the Spectrum. It produces a very unusual screen effect, but I am not sure exactly how! Using a small machine-code routine stored in the user-definable graphics area, the Interrupt Vector, I, is altered from its usual value of 63 to 64. (In fact, any value from 64 to 127 can be used).

On its own, this produces a slight picture break-up, as the ULA becomes confused. When a *Pause* statement is executed, very strange effects occur — sometimes the display is normal, sometimes each character is repeated, and other times a 'fruit-machine' effect occurs. To restore normality when running the program, press *Break* then *Goto* 100. The only real use of this program I can think of is to produce an impressive explosion effect, if line 60 is altered to *Pause* 0.

```
 10 FOR I=USR "A" TO USR "A"+4
 20 READ A: POKE I,A
 30 NEXT I
 40 INK 0: LIST: INK RND*6: LIST
 50 RANDOMIZE USR USR "A"
 60 PAUSE 20: GO TO 60
 70 DATA 62,64,237,71,201
100 POKE USR "A"+1,63
110 RANDOMIZE USR USR "A"
```

by Andrew Pennell

```
1 GOSUB10000
2 RN=7
10 POKE36879,93:PRINT"":POKE36878,15:POKE198,0
20 SC=0:KY=197:SP=0:FG=0:LI=4:PE=6
30 A$="                "
40 PRINT"        ";
50 FORK=1TO6:PRINTA$;"  ";:NEXTK
70 PRINT"        ";
80 FORK=1TO4:PRINT"                  ";:NEXTK
90 S$=" "
95 FORK=8120TO8141:POKEK,160:POKEK+30720,2:NEXT
100 PRINT"                    ";TAB(SP)S$
105 IFFG=1THENPOKEXX,93
106 IFFG=1THENIFPEEK(XX+22)=102THENPOKEXX,32:POKEXX+22,93:
POKEXX+22,32:FG=0
107 IFFG=1THENIFPEEK(XX+22)=113ORPEEK(XX+22)=112ORPEEK(XX+22)=
110THENGOSUB1000
108 IFGF=1THENPOKEFI,93
109 IFGF=1THENIFPEEK(FI)=102THENPOKEFI,93:POKEFI,32:GF=0
110 KL=PEEK(KY)
115 IFKL=43ANDGF=0THENGOSUB2000
120 IFKL=13THENSP=SP-1:IFSP<1THENSP=1
130 IFKL=21THENSP=SP+1:IFSP>18THENSP=18
131 PRINT"SCORE ";SC;:PRINT"               LIVES";LI
132 IFGF=1THENPOKEFI,32:FI=FI-22:IFFI<[illegible]THENGF=0:POKE36877,0
133 IFGF=1THENIFPEEK(FI)=102THENPOKEFI,32:GF=0:POKE36877,0
134 IFGF=1THENIFPEEK(FI)=221THENGOSUB3000
135 IFGF=1THENIFPEEK(FI)=106ORPEEK(FI)=116THENGF=0:T
HENSC=0:POKE36877,0:SC=SC-10:IFSC<0T
139 IFFG=1THEN145
140 IFRND(1)>(RN/10)THEN160
145 IFFG=1THENPOKEXX,32:XX=XX+22:IFXX>8120THENFG=0
150 GOTO100
160 XX=7878
170 HH=INT(RND(1)*7)
175 IFPEEK(XX+(HH*3)+22)<>221THEN170
180 XX=XX+(HH*3):FG=1:GOTO100
1000 POKEXX,32:POKEXX+22,93:POKEXX+22,32
1010 POKEXX+22,86
1020 POKE36877,150
1030 FORK=1TO50:NEXTK
1040 POKE36877,0
1050 FG=0:LI=LI-1:IFLI=0THEN4000
1060 RETURN
2000 FI=8099+SP-22+1
2010 GF=1:POKE36877,254:RETURN
3000 POKE36877,200
3005 FORH=1TO50:NEXTH:POKE36877,0
3010 POKEFI-23,120:POKEFI-21,120
3020 SC=SC+10
3035 GF=0:POKE36877,0:PE=PE-1:IFPE=0THEN6000
3036 FORH=1TO80:NEXTH
3037 POKEFI,32:POKEFI-22,32:POKEFI-44,32:POKEFI-23,32:POKEFI-21,32

3040 RETURN
4000 POKE198,0:FORV=1TO5
4001 POKE36875,170
4002 PRINT"                              GAME OVER"
4003 FORH=1TO[illegible]:NEXTH
4004 POKE36875,0
4010 PRINT"                              GAME OVER"
4020 FORH=1TO200:NEXTH
4030 NEXTV
4034 POKE36875,0
4035 PRINT"                    PLAY AGAIN?"
4036 GETA$:IFA$=""THEN4036
4037 IFA$="Y"THEN2
4038 IFA$="N"THENPRINT"BYE BYE":POKE36879,27:END
4039 GOTO4036
4040 GOTO10
6000 CLR:RN=RN-1:GOTO10
10000 POKE36879,25
10010 PRINT"MARTIAN'S REVENGE"
10020 PRINT"IN THIS GAME,UNLIKE"
10030 PRINT"MANY INVADER TYPES,"
10040 PRINT"YOU,THE MARTIANS,MUST"
10050 PRINT"ELIMINATE THE HUMANS"
10060 PRINT"AS YOU SEEK REVENGE,"
10070 PRINT"YOU MUST SHOOT DOWN"
10080 PRINT"THE NASTY HUMANOIDS"
10090 PRINT"BEFORE THEY EVENTUALLY";
10100 PRINT"KILL YOU,BEING A"
10200 PRINT"MARTIAN,HOWEVER,YOU"
10300 PRINT"HAVE  LIVES!"
10400 PRINT"NOT TO BE WASTED!"
10500 PRINT"HIT A KEY"
10600 GETA$:IFA$=""THEN10600
10700 PRINT"YOU MOVE BY:"
10800 PRINT"  LEFT"
10900 PRINT"  RIGHT"
11000 PRINT"    TO FIRE."
11100 PRINT"GET READY,AND"
11200 PRINT"HIT ANY KEY!"
11300 GETA$:IFA$=""THEN11300
11400 POKE198,0:RETURN
```

Martians
by John Coun

Night Bomber

on Vic-20

This program runs on an unexpanded Vic20 in a meagre 1.6K. To play the game you first select your difficulty level and air speed (ie: the heights of the buildings and length of delay loop). The computer then designs a cityscape which your jet must demolish.

You do this by using bombs (to drop press "F7") and missiles ("F5"). There is an unlimited supply ■ bombs but only three air-to-air missiles. Each section of building destroyed scores one point: missiles however, are an emergency measure and score no points.

The program is easily adapted to become easier or harder. For instance, by changing lines:

505: Range of missile (here = 10).

240: The odds of destroying the "next section" of building (here 1 in 6).

80: The heights of the buildings (here the minimum is 1 to a maximum of 17!).

Program notes:

Lines

55-120 — design the cityscape.

160-200 — move the plane.

145 + 215 — move the bomb.

140, 170 and 510 colour the plane, bomb and missiles.

500-580 — is the missile subroutine.

The main variables used are:

X — Main loop variable.

N — Main delay variable.

B — Position of bomb.

S + T — Control the shape of the bomb and the noise it makes while dropping.

V — Controls the amount of damage each bomb does.

D + E — Are the difficulty level and airspeed level.

The basic program is very simple and easily expanded and modified. You are advised to start on level one first and then progress, or else you'll be in for a shock.

```
10 POKE36879,110:POKE36878,15:HS=0
20 PRINT"J■    NIGHT BOMBER■■          BY"
25 PRINT"   PETER M BARTLEY"
30 PRINT"■■■PLEASE TYPE LEVEL OF"
35 INPUT"DIFFICULTY (1-9)";D:IFINT(D)<1ORINT(D)>9THEN 35
40 INPUT"■■■AIRSPEED (5-1)";E:E=INT(E):IFE>5ORE<1THEN40
45 M=3:Y=1:S=39:SC=0
50 REM*BUILD CITYSCAPE
55 POKE36879,8:PRINT"J"
60 FORZ=0TO21
65 H$="■■■■■"
70 PRINTMID$(H$,INT(RND(1)*8)+1,1)"■■■■■■■■■■■■■■■■■■■■■"
■ FORY=1TOINT(RND(1)*(8+D))
90 PRINTTAB(Z)"■ ■■",
95 POKE36876,212+Z+Y
100 NEXTY
105 PRINT"■1"
110 NEXTZ
120 POKE36876,0:FORN=1TO500:NEXTN
125 REM*MAIN LOOP
130 FORX=1TO472
140 IFB>0THENPOKE(38422+X+B),4
145 IFB>0THENPOKE(7702+X+B),8
150 IFB>0 AND T>0 THEN POKE36876,250-T
155 FORN=1TO(E-1)*10:NEXTN
160 POKE7701+X,32
170 POKE38424+X,1
180 POKE7702+X,252
190 POKE7703+X,121
200 POKE7704+X,82
205 IFB>0 THEN POKE36876,0
210 POKE36877,0
215 IFB>0THENPOKE(7702+X+B),32
220 IF7724+X+B>8163THENB=0 S=39:T=1
230 IFPEEK(7705+X)<>32THEN410
235 REM*'STRENGTH' OF BUILDING
240 IFB>0ANDPEEK(7724+X+B)=186THENV=INT(RND(1)*6)+1:S=86:
SC=SC+1:T=-1:POKE36877,190+V*10
250 IFV=2THENB=0 V=0:S=39:T=1
260 GETB$
270 IFB$="■"ANDB=0THENB=1
280 IFB$="■"ANDM>0THENH=1:M=M-1:GOSUB500
290 IFB>0THENB=B+21:T=T+1
300 PRINT"■SCORE:■"SC"■■■■■■■■■■■■■MISSILES:■"M
305 NEXTX
310 REM*SUCCESS
315 FORN=1TO1000:NEXT
320 FORN=1TO50
325 PRINT
330 POKE36877,200+N
335 NEXTN
340 POKE36877,0
345 PRINT"■■GOOD LANDING-WELL DONE"
350 REM*SCORE
360 PRINT"■■■YOUR SCORE WAS:"SC
365 IFSC=<HSANDHS>0THEN380
370 HS=SC:PRINT"■■YOU HAVE THE HIGHSCORE"
375 INPUT"TYPE YOUR INITIALS";N$:N$=LEFT$(N$,3)
380 PRINT"■■"N$" HAS THE HIGHSCORE WITH"HS
385 PRINT"■■PRINT YOUR LEVEL       ■S=SAME■■■■■■■■H=
HIGHER(BY ONE)"
390 GETY$:IFY$=""THEN390
395 IFY$="S"THEN45
400 IFY$="H"ANDD<9THEND=D+1:GOTO45
405 GOTO390
410 REM*FAILED
415 POKE36879,24:F=46:G=0:H=-2:I=0
420 FORN=FTOGSTEPH
425 POKE36877,200+N:POKE36883,N:FORK=1TO50:NEXT
430 POKE36877,0
435 NEXTN
440 PRINT"J■YOU CRASHED-TOUGH LUCK"
455 I=I+1:IFI=1THENF=0:G=46:H=2:GOTO420
460 GOTO360
500 REM*MISSILES
505 FORJ=250TO150STEP-10
510 POKE38424+H+X,2
520 POKE7704+H+X,82
530 POKE36877,J:POKE36876,J
540 POKE7704+H+X,32
550 H=H+1
560 NEXTJ
570 POKE36877,0:POKE36876,0
580 RETURN
```

Night Bomber
by Peter Bartley

```
10 DIMC$(10),DA(10),DB(10),DC$(10)
20 C$(0)="BLACK":C$(1)="BROWN":C$(2)="RED":C$(3)="ORANGE":C$(4)="YELLOW"
30 C$(5)="GREEN":C$(6)="BLUE":C$(7)="PURPLE":C$(8)="GREY":C$(9)="WHITE"
42 DC$(0)="":DC$(1)="0":DC$(2)="00":DC$(3)="000":DC$(4)="0000":DC$(5)="00000"
43 DC$(6)="000000":DC$(7)="0000000":DC$(8)="00000000":DC$(9)="000000000"
70 PRINT"■■■■ENTER RESISTANCE"
75 PRINT"■■■                    ■"
80 INPUTDA
90 INPUTDB
100 INPUTDC$
110 PRINT"■■■■1ST BAND- "C$(DA)
120 PRINT"■■■■2ND BAND- "C$(DB)
130 PRINT"■■■■3RD BAND- "C$(LEN(DC$))
140 PRINT"■■■■ANOTHER RESISTOR?- Y/N■"
150 GETA$:IFA$=""THEN150
152 IFA$<>"Y"THENSTOP
155 CLR
160 GOTO10

READY.
```

Resistor
by Richard Barton

Resistor

on Vic

Type in the resistance required, each digit other than zeros being followed by return. Enter zeros together — and return. The program will then show the colour-code for that resistance.

Disassembler

on BBC Micro

I have written an interesting program on my BBC micro to enable users to see what is going on inside the memory of their micro. I have written it on a Model B, but since it is very short and uses Mode 4 it will run on a Model A.

The variables used are:

X% the start of the current block of eight 'peek' addresses.

A% a looping variable.

CHAR an array used to store each block of eight contents of 'peek' addresses.

I have used an internal variable to create field size and have defined it as being 3 (see manual pp. 70-72).

Program:

```
10 MODE 7:P.TAB(5,5);CHR$141;
   "DISSASSEMBLER".
20 P.TAB(5,6);CHR$141;"DISSASSEMBLER.
30 P.TAB(7,7);"————".
40 This program is designed to enable the " ' ' " user
   to read parts of the memory, " ' ' " in particular the
   BASIC interpreter " ' " which starts at address
   32768. " ' ' " To stop the listing at any one point
   " ' ' " press <CTRL> and <SHIFT>";
50 P.;"at the same " ' ' "time."
60 I.' ' " STARTADDRESS ",X%.
70 MO.4.
80 VDU23,256,256,255,255,255,255,255,255,255.
90 @%=&00203.
100 P.'''
110 DIM CHAR(8).
120 P.':~X%;" ";
130 IF INKEY(0)=ASC"A" RUN:REM PRESS 'A' TO
    ABORT AT ANY TIME.
140 *FX15,1.
150 FOR A%=X% TO X%+7.
160 CHAR(A%-X%)=?A%.
170 IF CHAR(A%-X%) 16 P.;" ";
180 P.;~CHAR(A%-X%),;
190 NEXT.
200 P.;" ";:FOR A%=0 TO 7.
210 IF CHAR(A%)>32 THEN P.;CHR (CHAR(A%) );
    ELSE P.;".";
220 NEXT A%.
230 X%=X%+8.
240 GOTO 120.
```

by Tim Zobel

```
 .5 REM** e,by A. Tennant August '82 **
 10 MODE7
 20 INPUT"HOW MANY PLACES OF DECIMALS DO YOU
         REQUIRE ",P
 30 P%=P+4
 40 DIMA%(P%+1),B%(P%+1):B%(1)=1
 50 F%=0:N%=0:J%=1:T%=10:R%=0:Z%=0
 60 REPEAT:N%=N%+J%
 70 FORI%=J%TOP%
 80 B%(I%+J%)=B%(I%+J%)+(B%(I%) MOD N%)*T%
 90 B%(I%)=B%(I%) DIV N%
100 NEXTI%
110 FORI%=P%TOJ%STEP-J%
120 S%=A%(I%)+B%(I%)
130 IFS%<T% F%=Z% ELSE F%=J%:S%=S%-T%
140 A%(I%)=S%
150 NEXTI%
160 IF?215=226 PROCTYP
170 PROCACC:IFR%=J% VDU7:PRINT;''"e to "P"
places":PROCTYP:END
180 UNTIL FALSE
190 DEFPROCACC
200 R%=J%
210 FORI%=P%TOJ%STEP-J%
220 IFB%(I%)<>Z% I%=J%:R%=Z%
230 NEXTI%
240 ENDPROC
250 DEFPROCTYP:PRINT;'"2.";
260 FORI%=J%+J%TOP+J%
270 PRINT;A%(I%);
280 NEXTI%
290 PRINT''
300 ENDPROC
```

Calc
by Alan Tennant

Calc

on BBC Micro

This program, written for the BBC micro (A or B), will calculate the numerical value of "e" to any required number of decimal places. The maximum number of decimal places is restricted by the amount of memory available.

After entering the number of places you require there will be a delay while the computer calculates the correct value. During this period the user can get a display of the current — inaccurate — value by holding down the space bar.

The program makes use of the converging series:

e=1/0!+1/1!+1/2!+1/3!+1/4!+ . . .

All the arithmetic is done in a longhand fashion, using the arrays A% and B%, to give the large number of decimal places. Lines 60 to 100 calculate the successive terms in the series, each new term being held in the array B%.

Lines 110 to 150 then add this new term to the current sum in the array A%.

Line 160 checks whether the space bar has been pressed.

Line 170 calls *Procacc* and if R%=1 (value accurate) calls *Proctyp* to print the value.

Procacc is defined in lines 190 to 240 and sets the flag R% to one when every term in B% is zero.

Proctyp, defined in lines 250 to 300, prints the current approximation of "e" held in A%.

Klingon

on Spectrum

By cunning and stealth we, the Klingon race, have constructed a very special installation on the planet Grool. The Federation is sending ships from every Starbase in this sector to attempt to destroy it.

It is your task to prevent them from doing so. We will supply you with seven ships and unlimited ammunition. We have sent out distress calls to all Klingon outposts and expect reinforcements to arrive at any time. (In other words you get a bonus ship every 250 points). Should you succeed in destroying all the Federation Starships, (reach a score of 2,000 points) you will receive a substantial promotion, as well as the gratitude of the entire Klingon people, if you fail you will of course be killed.

Program notes.

The Starship in lines 150, 155, 890, 985 and 1200 is made up of the graphic characters "S", "H", "P".

The Klingon ship in lines 120, 190, 210 and 1580 is made up of the graphic characters "T", "K".

Line(s)	Effect
5	This "pokes" the caps shift off.
10 to 70	Introduction and option for instructions.
83 to 89	Select level of difficulty.
100 to 260	Main loop (printing and unprinting of ships, reading the keys).
270 to 850	Initialisation (defining the graphic characters, plotting the stars, drawing the planet etc)
860 to 870	Klingon photon fire.
940	Awards a bonus ship if score is a multiple of 250 points.
950	Checks if your score has reached 2,000 points yet.
960 to 1030	Increases 1 (enemy landed) by one, if this makes 1=7 control passes to 1120, otherwise sounds alarm and resets Starship.
1120 to 1230	The plant is destroyed (quite spectacularly).
1240 to 1310	Play again option
1320 to 1500	Instructions.
1510 to 1560	Play Beethoven's 5th symphony, (well, sort of).
1580 to 1590	Bonus ship subroutine.
1610 to 1710	Hey!, you won.

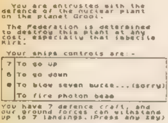
When the program is run you will see your ship cruising above the planet in a starry sky. The enemy Starships will approach from the left and must be shot before they reach the planet's surface.

You move using the 7 and 6 keys and fire using the [illegible] key. If your ship is destroyed, a replacement (assuming that

to next page

you have any left) will fly in from the fleet shown in the top left of the screen.

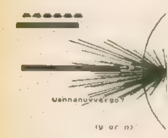
When either ■ your ships are destroyed or seven enemy craft have penetrated your defences, the plant on the planet's surface will explode and the game will be over. If you can make it to two thousand points then you have won, and will be treated with all the respect due to a true war hero.

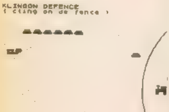


```
  You are entrusted with the
defence of the nuclear plant
on the planet Grool.

 The Federation is determined
to destroy this plant at any
cost, especially that imbecile
Kirk.

 Your ships controls are:-
 7 | To go up
 6 | To go down
 0 | To blow seven bucke...(sorry)
   | To fire photon beam
You have 7 defence craft, and
our ground forces can withstand
up to 7 landings.(Press any key)
```





```
   0>REM
         © Gary Kennedy 1982
   5 POKE 23658,0
  10 INK 7: PAPER 1: BORDER 1
  20 CLS
  30 PRINT AT 3,6; INVERSE 1;" K
LINGON DEFENCE "
  40 PRINT AT 10,6; INVERSE 1;"W
elcome to the battle"
  50 PRINT AT 15,0;"Like to read
 the instructions?": PRINT AT 19
,19;"press y or n"
  60 IF INKEY$="y" THEN GO TO 13
20
  70 IF INKEY$<>"n" THEN GO TO 6
0
  80 BORDER 0: PAPER 0
  83 INPUT "Enemy fire rate?
             1 (Lots) 2 (Some) or
 3 (None)";e$
  86 IF CODE e$<49 OR CODE e$>51
 THEN GO TO 83
  89 LET elr=CODE e$-48
  90 GO TO 270
 100 IF INKEY$="7" AND x>1 THEN
LET x=x-1
 110 IF INKEY$="6" AND x<20 THEN
LET x=x+1
 120 IF c<>0 THEN PRINT AT x,25;
" ";AT x+1,25;"  ";AT x-1,25;"
"
 130 IF INKEY$="0" THEN GO TO 86
0
 150 PRINT AT s,h; INK 7; OVER 1
;" "
 155 PRINT AT s,h+1; OVER 1; INK
7;" "
 156 PRINT AT s,h; INK 0; OVER 1
;" "
 160 IF x<>s OR RND>=elr/3 THEN
GO TO 240
 170 BEEP .3,-30: BEEP .1,20: PR
INT AT s,5; INK 7; OVER 1;"_____
_____________";AT s,6; INK 7;
 OVER 1;"___________________"
 180 OVER 0: IF x=s THEN LET c=c
-1
 190 IF x=s THEN FOR z=6 TO 0 ST
EP -1: PRINT AT s,25; INK z; OVE
R 0;" ": BEEP .1,z: NEXT z
 200 IF x=s AND c>0 THEN FOR r=0
 TO c-1: PRINT AT 0,r*2+4; OVER
0;" ": NEXT r
 210 OVER 0: IF x=s AND c>=1 THE
N FOR x=c*2+2 TO 25: PRINT AT 0,
x;" ": BEEP .05,50: PRINT AT 0,
x;" ": NEXT x: FOR x=0 TO s-1:
PRINT AT x,25;" ": BEEP .05,50:
 PRINT AT x,25;" ": NEXT x
 220 IF c=0 THEN GO TO 1120
 240 OVER 0: LET h=h+1
 250 IF h>=28 THEN GO TO 980
 260 GO TO 100
 270 POKE USR "t"+0,0
 280 POKE USR "t"+1,0
 290 POKE USR "t"+2,BIN 00001111
 300 POKE USR "t"+3,BIN 00001010
 310 POKE USR "t"+4,BIN 00011111
 320 POKE USR "t"+5,BIN 00111111
 330 POKE USR "t"+6,BIN 01101011
 340 POKE USR "t"+7,BIN 00111111
 350 POKE USR "k",0
 360 POKE USR "k"+1,0
 370 POKE USR "k"+2,BIN 11110000
 380 POKE USR "k"+3,BIN 01010000
 390 POKE USR "k"+4,BIN 11111000
 400 POKE USR "k"+5,BIN 11111100
 410 POKE USR "k"+6,BIN 11010110
 420 POKE USR "k"+7,BIN 11111100
 430 POKE USR "s",0
 440 POKE USR "s"+1,BIN 11111111
 450 POKE USR "s"+2,BIN 11111111
 460 POKE USR "s"+3,BIN 00100000
 470 POKE USR "s"+4,BIN 00100000
 480 POKE USR "s"+5,BIN 11111111
 490 POKE USR "s"+6,BIN 01111111
 500 POKE USR "s"+7,BIN 11111111
 510 POKE USR "h"+0,BIN 00000001
 520 POKE USR "h"+1,BIN 11100011
 530 POKE USR "h"+2,BIN 11100110
 540 POKE USR "h"+3,BIN 10000011
 550 POKE USR "h"+4,BIN 10000001
 560 POKE USR "h"+5,BIN 11111111
 570 POKE USR "h"+6,BIN 10101011
 580 POKE USR "h"+7,BIN 11111111
 590 POKE USR "p"+0,BIN 11111100
 600 POKE USR "p"+1,BIN 11111110
 610 POKE USR "p"+2,BIN 10101011
 620 POKE USR "p"+3,BIN 11111110
 630 POKE USR "p"+4,BIN 11111100
 640 POKE USR "p"+5,BIN 11000000
 650 POKE USR "p"+6,BIN 10000000
 660 POKE USR "p"+7,BIN 00000000
 670 CLS
 680 FOR q=0 TO 100 STEP 2
 690 PLOT INK 7,RND*210,q*1.7
 700 BEEP .03,q*RND-30
 710 NEXT q
 720 PLOT 255,0
 730 DRAW INK 7;0,175,-PI/2
 740 LET c=7
 750 LET sc=0
 760 LET h=0
 770 LET s=INT (RND*20)+1
 780 INK 2
 790 LET o=0
 800 LET i=1
 810 LET l=0
 820 PRINT AT 10,30; INK 6;" ",
AT 11,30;" "
 840 LET x=s
 850 GO TO 200
 860 IF h<=23 THEN FOR n=2 TO 3:
 BEEP .1,n*-10: PRINT AT x,5; OV
ER 1; INK n;"---------------------
-": NEXT n: PRINT AT x,5; INK 7;
 OVER 1;"                      "
 870 IF h>=24 THEN FOR n=2 TO 3:
 BEEP .1,n*-10: PRINT AT x,27; I
NK n;"---": NEXT n: PRINT AT x,2
7;"   "
 880 IF x=s THEN LET sc=sc+10
 890 IF x=s THEN FOR v=7 TO 0 ST
EP -1: PRINT AT s,h; INK v;" "
: BEEP .05,v: BEEP .1,v*5: NEXT
v: PRINT AT s,h; OVER 1;" "
 910 IF x=s THEN LET s=INT (RND*
20)+1: LET h=0
 920 PRINT AT 21,0; INK 7;"SCORE
:";sc;"   ENEMY LANDED :";l
 940 IF sc=250 OR sc=500 OR sc=7
50 OR sc=1000 OR sc=1250 OR sc=1
500 THEN GO SUB 1580
 950 IF sc>=2000 THEN GO SUB 1610
 970 GO TO 100
 980 LET l=l+1
 990 PRINT AT s,h; INK 7; OVER 1
;" "
1010 PRINT AT 21,0; INK 7;"SCORE
:";sc;"   ENEMY LANDED :";l
1030 IF l=7 THEN GO TO 1120
1040 LET h=0
1050 LET s=INT (RND*20)+1
1060 FOR w=0 TO 4: BEEP .3,-10:
BEEP .15,-20: BEEP .07,-30: NEXT
 w
1080 PRINT AT 10,30; INK 6;" "
1090 PRINT AT 11,30; INK 6;" "
1110 GO TO 100
1120 FOR f=0 TO -160 STEP -5
1130 PLOT 255,88
1140 DRAW f,RND*60
1150 PLOT 255,88
1160 DRAW f,-RND*60
1170 BEEP .05,30
1180 NEXT f
1190 INK 7: PAPER 0
1200 LET a$=" GROOL HAS FALLEN--
- "
1210 FOR x=22 TO 0 STEP -1
1220 PRINT AT 10,4; INVERSE 1;a$
(x+1 TO 22): PAUSE 10
1230 NEXT x
1240 PRINT AT 16,10;"Wannanuvver
go?"
1260 PRINT AT 2,3; INVERSE 1;"YO
U SCORED: ";sc
1270 PRINT AT 21,0;"
    (y or n)"
1280 IF INKEY$="y" THEN GO TO 80
1290 IF INKEY$<>"n" THEN GO TO 1
280
1300 CLS
1310 STOP
1320 CLS
1330 PRINT "  You are entrusted
with the ","defence of the nucle
ar plant ","on the planet Grool.
"
1340 PRINT
1350 PRINT " The Federation is d
etermined","to destroy this plan
t at any ","cost, especially tha
t imbecile","Kirk."
1360 PRINT
1370 PRINT " Your ships controls
 are -"
1380 PRINT
1390 PRINT " 7 To go up"
1400 PRINT
1410 PRINT " 6 To go down"
1420 PRINT
1430 PRINT " 0 To blow seven buc
ke...(sorry)"
1440 PRINT
1450 PRINT "    To fire photon be
am"
1460 PLOT 0,93: DRAW 255,0: DRAW
 0,-65: DRAW -255,0: DRAW 0,65
1470 PLOT 20,28: DRAW 0,66
1480 PRINT
1490 PRINT "You have 7 defence c
raft, and","our ground forces ca
n withstand up to 7 landings."
1500 PRINT AT 21,17;"(Press any
key)"
1510 LET t=-3
1520 PAUSE 0
1530 BEEP .2,t: BEEP .2,t: BEEP
.2,t: BEEP .7 ,t-5
1540 PAUSE 20
1550 LET t=-6
1560 BEEP .2,t: BEEP .2,t: BEEP
.2,t: BEEP .6 ,t-6
1570 GO TO 80
1580 FOR n=0 TO 5: PRINT AT 21,0
; INK 4;"
       ": BEEP .1,0: BEEP .1,10: PR
INT AT 21,0;"
        ": NEXT n: LET c=c+1: PR
INT AT 0,c*2;" "
1590 LET sc=sc+20
1600 RETURN
1610 FOR x=1 TO 6: BORDER x: PAP
ER x: CLS : PAUSE 10: NEXT x
1620 BORDER 2: PAPER 1: INK 7: C
LS
1630 PRINT '''"   O.K. YOU WIN!!!
"
1640 PRINT AT 10,3; INVERSE 1; F
LASH 1;" THE FEDERATION SURRENDE
RS "
1650 PRINT AT 16,3;" YOU ARE NOW
 COMMANDER OF","        THE ENTIRE
 KLINGON FLEET!!"
1660 PRINT AT 20,1;"If you would
 like another go ","       please
press y....SIR!."
1670 FOR x=-30 TO 50: BEEP .03,x
: NEXT x
1680 IF INKEY$="" THEN GO TO 168
0
1690 IF INKEY$="y" THEN GO TO 80
1700 IF INKEY$<>"n" THEN STOP
1710 STOP
```

PROGRAM OF THE WEEK

Klingon
by Gary Kennedy

Basic monitor

on Spectrum

This is a program for machine code programmers, in which they can enter data in hex. First, select the address to where the program is to be entered and then use normal hex numbers to enter data. The address and data are displayed in both hex and decimal. A hex to decimal and a decimal to hex converter is also provided.

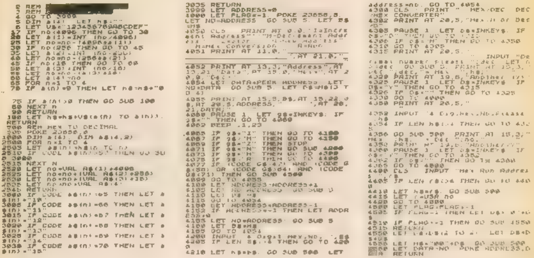
The program displays ■ menu and uses single key strokes to select various modes. Two hex numbers for each byte must be entered.

5-3035 is the conversion routines.

4000 prints the display which is then followed by the main loop.

To next page

Open Forum



```
   2 REM [redacted]
   3 REM
   4 GO TO 3999
   5 DIM a(4): LET h$=""
   6 LET v$="123456789ABCDEF"
  17 IF no<4096 THEN GO TO 30
  20 LET a(1)=INT (no/4096)
  25 LET no=no-(4096*a(1))
  30 IF no<256 THEN GO TO 45
  35 LET a(2)=INT (no/256)
  40 LET no=no-(256*a(2))
  45 IF no<16 THEN GO TO 60
  50 LET a(3)=INT (no/16)
  55 LET no=no-(a(3)*16)
  60 LET a(4)=no
  65 FOR n=1 TO 4
  70 IF a(n)=0 THEN LET h$=h$+"0"
  75 IF a(n)>0 THEN GO SUB 100
  80 NEXT n
  90 RETURN
 100 LET h$=h$+v$(a(n) TO a(n)):
RETURN
 500 REM HEX TO DECIMAL
 505 POKE 23658,8
1000 DIM a(4): DIM a$(4,2)
2500 FOR n=1 TO 4
2505 LET a$(n)=h$(n TO n)
2510 IF CODE a$(n)>57 THEN GO SU
B 3000
2515 NEXT N
2520 LET no=VAL A$(1)*4096
2525 LET no=no+(VAL A$(2)*256)
2530 LET no=no+(VAL A$(3)*16)
2535 LET no=no+VAL A$(4)
2545 RETURN
3000 IF CODE a$(n)=65 THEN LET a
$(n)="10"
3005 IF CODE a$(n)=66 THEN LET a
$(n)="11"
3015 IF CODE a$(n)=67 THEN LET a
$(n)="12"
3020 IF CODE a$(n)=68 THEN LET a
$(n)="13"
3025 IF CODE a$(n)=69 THEN LET a
$(n)="14"
3030 IF CODE a$(n)=70 THEN LET a
$(n)="15"
3035 RETURN
3999 LET ADDRESS=0
4000 LET FLAG=-1: POKE 23658,8:
LET NO=ADDRESS: GO SUB 5: LET B$
=H$
4050 CLS : PRINT AT 0,0;"I=Incre
ment Address""M-Decrement Addr
ess"[illegible]"N=New Address"
  H=Hex Conversion    R=Run"
4051 PRINT AT 11,0;"________________";AT 21,0;"________________"
4052 PRINT AT 13,3;"Address";AT
13,21;"Data";AT 15,0;"Hex";AT 2
0,0;"Dec"
4054 LET DATA=PEEK ADDRESS: LET
NO=DATA: GO SUB 5: LET C$=H$(3 T
O 4)
4055 PRINT AT 15,5;B$;AT 15,22;C
$;AT 20,5;ADDRESS;"    ";AT 20,
21;DATA;"  "
4060 PAUSE 1: LET G$=INKEY$: IF
G$="" THEN GO TO 4060
4062 BEEP .1,20
4065 IF G$="I" THEN GO TO 4100
4067 IF G$="M" THEN GO TO 4150
4069 IF G$="Z" THEN STOP
4071 IF G$="N" THEN GO SUB 4200
4073 IF G$="H" THEN GO TO 4300
4075 IF G$="R" THEN GO TO 4400
4077 IF (CODE G$>47) AND (CODE G
$<58) OR (CODE G$>64) AND (CODE
G$<71) THEN GO SUB 4500
4099 GO TO 4055
4100 LET ADDRESS=ADDRESS+1
4105 LET NO=ADDRESS: GO SUB 5
4110 LET B$=H$
4115 GO TO 4054
4150 LET ADDRESS=ADDRESS-1
4152 IF ADDRESS=-1 THEN LET ADDR
ESS=0
4155 LET NO=ADDRESS: GO SUB 5
4160 LET B$=H$
4165 GO TO 4054
4200 INPUT "4 Digit HEX.NO. ";B$
4205 IF LEN B$<>4 THEN GO TO 420
0
4210 LET h$=B$: GO SUB 500: LET
address=no: GO TO 4054
4300 CLS : PRINT "  HEX-DEC  DEC
-HEX CONVERTER"
4302 PRINT AT 20,5;"Hex (H) or Dec
(D)"
4305 PAUSE 1: LET D$=INKEY$: IF
D$="D" THEN GO TO 4315
4306 IF D$="H" THEN GO TO 4350
4310 GO TO 4305
4315 PRINT AT 20,5;"
          ": INPUT "De
cimal number please ";dec: LET n
o=dec: GO SUB 5: PRINT AT 15,3;"
Dec ";dec,"= Hex ";h$;"    "
4320 PRINT AT 19,6;"Another (Y)"
4325 PAUSE 1: LET D$=INKEY$: IF
D$="Y" THEN GO TO 4315
4326 IF D$="" THEN GO TO 4325
4330 GO TO 4000
4350 PRINT AT 20,5;"
  "
4352 INPUT "4 Digit hex. No. Please "
;h$
4354 IF LEN h$<>4 THEN GO TO 435
2
4356 GO SUB 500: PRINT AT 18,3;"
Hex ";h$;" = Dec ";no;"  "
4358 PRINT AT 19,6;"Another (Y)"
4360 PAUSE 1: LET D$=INKEY$: IF
D$="Y" THEN GO TO 4350
4362 IF D$="" THEN GO TO 4360
4365 GO TO 4000
4400 CLS : INPUT "Hex Run Addres
s ";r$
4405 IF LEN r$<>4 THEN GO TO 440
0
4410 LET h$=r$: GO SUB 500
4415 LET r=USR no
4420 GO TO 4000
4500 LET FLAG=FLAG+1
4505 IF FLAG=1 THEN LET D$=G$+G
$
4510 IF FLAG=-3 THEN GO SUB 4550
4515 RETURN
4550 LET [illegible] TO 2): LET D$=D
$+G$
4555 LET H$="00"+D$: GO SUB 500
[illegible] LET DATA=NO: POKE ADDRESS,D
ATA: RETURN
```

Basic Monitor
by John Walsh

Better than Basic

Can you program in a computer language other than Basic?

Enter this challenging new competition and win a Jupiter Ace.

Basic, for all its advantages, is slow. Programs written in Basic tend to look rather pedestrian when compared to programs written in some other languages such as machine code.
We want something different, something faster than Basic. It could be machine code, Forth, Lisp, Pascal or Fortran. In fact, your entry can be written in anything that is not Basic. And the best non-Basic program, be it game, utility or other, will win the Jupiter Ace.

The entries will be judged by *Popular Computing Weekly* editor, Brendon Gore, and Jupiter Ace designers Richard Altwasser and Steve Vickers. In their selection account will be taken both of the standard of the program and of the accompanying documentation. The whole range of languages and types of program are allowed. The only stipulation is that it must not be written in Basic.

Entries to the award scheme must be accompanied by four of the numbered coupons published in *Popular Computing Weekly* throughout October. The closing date for the competition is November 18. The winning entry will be announced in the issue published on December 23.

Rules

1. *There is no limit on the number of entries you can send in, but each entry must be accompanied by four differently numbered competition coupons.*
2. *Closing date for entries is November 18, 1982.*
3. *The names of the winners will be announced in the December 23 issue of Popular Computing Weekly.*
4. *The Judges' decision is final.*
5. *No employees of Sunshine Publications Ltd, or their families, will be eligible to enter the competition.*

Popular Computing Weekly
Better than Basic Competition

NAME: ....

ADDRESS: ....

....

....

....

Fill in this coupon. When you have collected four differently numbered coupons, send them with your program to: *Popular Computing Weekly*, Better than Basic, Hobhouse Court, 19 Whitcomb Street, London WC2.

③

Line-up on shady characters

Malcolm Davison explains how to construct 3D cones and cylinders.

Having established how to draw an ellipse (*Popular Computing Weekly*, October 7), this article paves the way ■ constructing 3D representations ■ cones and cylinders, and introduces the idea of 'shading' to give the illusion of solidity.

To draw the cylinder, I first planned the drawing on graph paper marked with the plot and print positions. The lengths and positions of the major and minor axes can quickly be ascertained and the lengths ■ the lines between them.

Coding was straightforward, see 'cylinder'. Lines 60-140 and 400-510 draw the outline of the ellipse, while lines 795-812 draw a series of lines of the same length from different plot positions. The second half of the *Plot* statements in lines 400, 410, 500 and 510 are repeated for the *Draw* statements.

'Cylinder 2' is the same as 'cylinder' up to line 520, but adds a shading routine and draws the right-hand edge of the cylinder. The shading effect ■ produced by plotting the circumference of an ellipse, but reducing the frequency of the plotting points (lines 795 and 796), and then using these points as the starting position for a *Draw* statement. Line 794 draws the top line on the cylinder.

Cylinder development

The 'cone' ■ a development of the cylinder. Lines 1-530 draw the ellipse and lines 620-637 draw the left-hand lines ■ the tip of the cone. Lines 650-654 draw the right-hand lines and lines 685-690 draw the lines to the extremities of the ellipse.

'Pattern 1' starts as a straightforward plot of an ellipse. The value of the major axis (*m*) is increased during each loop. While the count 'a' in line 90 is sufficient for the first full circumference of the ellipse, as '*m*' increases ■ falls short for subsequent loops. As ■ result, it produces curves to the left and right of the ellipse.

'Pattern 2' ■ the result of repeatedly plotting an ellipse further along the *x* axes. The program runs for about three-quarters of an hour. ■ you want a record of it, store it on tape using *Save* "pattern 2" *Screen*.

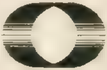
■ you want an intermediate printout just press the *Shift* and *Break* keys, followed by *Copy*. After the printout is complete, press *Continue*. If at any time you want to know how far the program has got — break into the program and type *Lprint j*, which will print the value of the loop count (1 to 50) onto the printer and so will not affect the display. Then press *Continue*.

```
  1 REM "cylinder"
  2 PAPER 4: INK 6: BORDER 0: C
LS
 60 DEF FN v(n,m,a)=INT SQR ((m
↑2)-((m↑2/n↑2)*(a↑2)))
 70 DEF FN w(n,m,a)=INT SQR ((n
↑2)-((n↑2/m↑2)*(a↑2)))
 80 LET m=24: LET n=32: LET r=5
0: LET s=87
 90 FOR a=0 TO 17 STEP 1
100 LET y=FN v(m,n,a)
110 GO SUB 400
130 FOR a=22 TO 0 STEP -1
140 LET x=FN w(m,n,a): GO SUB 5
00
150 GO TO 795
400 PLOT r-a,s-y: PLOT a+r,s+y
410 PLOT r-a,s+y: PLOT a+r,s-y
420 NEXT a: RETURN
500 PLOT r-x,s-a: PLOT r+x,s+a
510 PLOT r-x,s+a: PLOT r+x,s-a
520 NEXT a: RETURN
795 FOR a=0 TO 15 STEP 1
796 LET y=FN v(m,n,a)
801 PLOT a+r,s+y: DRAW 144,0
803 PLOT a+r,s-y: DRAW 144,0
804 NEXT a
806 FOR a=23 TO 0 STEP -1
807 LET x=FN w(m,n,a)
808 PLOT r+x,s+a: DRAW 144,0
811 PLOT r+x,s-a: DRAW 144,0
812 NEXT a
```

```
  1 REM "cone"
  2 PAPER 7: INK 6: BORDER 2: C
LS
 60 DEF FN v(n,m,a)=INT SQR ((m
↑2)-((m↑2/n↑2)*(a↑2)))
 70 DEF FN w(n,m,a)=INT SQR ((n
↑2)-((n↑2/m↑2)*(a↑2)))
 80 LET m=32: LET n=16: LET r=1
27: LET s=47
 90 FOR a=0 TO 20 STEP 1
100 LET y=FN v(m,n,a)
110 GO SUB 400
240 FOR a=12 TO 0 STEP -.5
250 LET x=FN w(m,n,a)
270 GO SUB 500
300 GO TO 620
400 PLOT r-a,s-y: PLOT a+r,s+y
410 PLOT r-a,s+y: PLOT a+r,s-y
420 NEXT a: RETURN
500 PLOT r-x,s-a: PLOT r+x,s+a
510 PLOT r-x,s+a: PLOT r+x,s-a
520 NEXT a
530 RETURN
620 FOR a=6 TO 30 STEP 4
630 LET y=FN v(m,n,a)
635 PLOT r-a,s+y: DRAW 127+a-r,
136-s-y
637 NEXT a
650 FOR a=1 TO 10 STEP 5
651 LET y=FN v(m,n,a)
652 PLOT r+a,s+y: DRAW 127-a-r,
136-s-y
654 NEXT a
685 PLOT 98,47: DRAW 30,88
690 PLOT 155,47: DRAW -28,88
```

```
  1 REM "cylinder2"
  2 PAPER 4: INK 0: BORDER 0: C
LS
 60 DEF FN v(n,m,a)=INT SQR ((m
↑2)-((m↑2/n↑2)*(a↑2)))
 70 DEF FN w(n,m,a)=INT SQR ((n
↑2)-((n↑2/m↑2)*(a↑2)))
 80 LET m=24: LET n=30: LET r=5
5: LET s=87
 90 FOR a=0 TO 17 STEP 1
100 LET y=FN v(m,n,a)
110 GO SUB 400
130 FOR a=22 TO 0 STEP -1
140 LET x=FN w(m,n,a): GO SUB 5
00
150 GO TO 794
400 PLOT r-a,s-y: PLOT a+r,s+y
410 PLOT r-a,s+y: PLOT a+r,s-y
420 NEXT a: RETURN
[illegible] PLOT r-x,s-a: PLOT r+x,s+a
[illegible] PLOT r-x,s+a: PLOT r+x,s-a
[illegible] NEXT a: RETURN
[illegible] PLOT 60,110: DRAW 144,0: LE
T t=1
795 FOR a=0 TO 23 STEP t
796 LET t=8-(a/20)
798 LET y=FN v(m,n,a)
803 PLOT a+r,s-y: DRAW 144,0
804 NEXT a
820 LET r=199: LET s=87
830 FOR a=0 TO 17 STEP 1
840 LET y=FN v(m,n,a)
850 PLOT a+r,s+y: PLOT a+r,s-y:
NEXT a
860 FOR a=22 TO 0 STEP -1
870 LET x=FN w(m,n,a)
880 PLOT r+x,s+a: PLOT r+x,s-a:
NEXT a
```

```
  1 REM "pattern1"
  2 PAPER 1: INK 7: BORDER 0: C
LS
 60 DEF FN v(n,m,a)=INT SQR ((m
↑2)-((m↑2/n↑2)*(a↑2)))
 70 DEF FN w(n,m,a)=INT SQR ((n
↑2)-((n↑2/m↑2)*(a↑2)))
 80 LET t=1: LET m=55: LET n=56:
 LET r=127: LET s=87
 88 FOR j=1 TO 18
 90 FOR a=1 TO 22 STEP 1
100 LET y=FN v(m,n,a)
110 GO SUB 400
290 LET t=1: LET m=m+1
320 NEXT j: STOP
380 STOP
400 PLOT r-a-2,s-y: PLOT 2*a+r,
s+y
410 PLOT -2*r-a,s+y: PLOT 2*a+r
,s-y
420 NEXT a: RETURN
```



```
  1 REM "pattern2"
  2 PAPER 1: INK 7: BORDER 0: C
LS
  6 DEF FN v(m,n,a)=INT SQR ((m
↑2)-((m↑2/n↑2)*(a↑2)))
  7 GO TO 60
 10 LET t=1
 15 LET m=55: LET n=65
 20 FOR a=1 TO 65 STEP 1
 25 LET t=1-(1/100)
 30 LET y=FN v(m,n,a)
 40 PLOT j-a+100,70-y
 41 PLOT j+a+100,y+70
 42 PLOT j-a+100,y+70
 43 PLOT j+a+100,70-y
 50 NEXT a
 55 NEXT j
 57 STOP
 60 FOR j=1 TO 50
 70 GO TO 10
```

Channelling musical talents

***Peter Donn** presents a program to turn the BBC micro (A or B) into a musical synthesiser.*

Who would have thought you could fit over three octaves of a musical stave onto a typewriter keyboard, including sharps and flats? Well, the following program does just that.

The first key used is 'Z' which represents the first 'C'. The second keyboard row is the 'black' notes. The scale continues on the third row, with their black notes on the fourth row. The shift key has been utilised on the first row so three octaves of 'C' can be fitted onto the keyboard, including 'D' and 'E' above the highest 'C' which are often used in musical tunes.

The program is called 'synthesiser', since you can play [illegible] any of three voices, piano, xylophone or organ. These voices can be selected by function keys 4, 5 and 6 respectively.

Several other sound effects are contained in function keys 0-3. These are:

0 High frequency cannon shot
1 Medium frequency cannon shot
2 Low frequency cannon shot
3 This is rather a special effect. It performs a 'ruler twanging' operation proportional to the frequency of sound channel 1 at that moment. Try it out and you will see what I mean.

Function keys 7, 8 and 9 contain three separate 'pages' of tunes displayed [illegible] the form of different characters. If you want to play one of the tunes, use the cursor control keys to take the editing cursor to the start of the tune. Now press the copy key and keep it held down. It may surprise you to find that this is identical to playing the whole tune on the keyboard.

The displayed characters are a very good way of helping people learn to play various tunes by heart.

The program starts and the function keys are assigned their roles in lines 30-120. Line 130 enables the user to start off in piano mode. Line 140 defines the envelope for channel [illegible] sound effects, giving priority to the amplitude part of the envelope. Line 170 assigns the complete keyboard to A$.

On line 210 the program starts a quick analysis to see if a key [illegible] being pressed down. Line 220 checks to see if the shift key is being held down. Lines 230 to 320 determine if you have selected one of your options.

The next command, on line 330, is very useful. It detects a string or [illegible] character, within a string, and stores its value, eg if *B$* had been *Z*, then *Instr(A$,B$)* would be one.

Procedure *Stop* simply empties the buffer for sound channel 1. The following three procedures perform four different channel 0 sound effects. Next, the three voices are defined, using envelope once again.

Finally, the three pages of tunes are incorporated [illegible] three procedures. You can see from this how easy it is to make up your own tunes and play them using the editing keys.

```
5 REM SYNTHESISER BY PETER DONN '82
10 MODE 7
20 PRINT '''
30 *KEY 0 a
40 *KEY 1 b
50 *KEY 2 c
60 *KEY 3 d
70 *KEY 4 e
80 *KEY 5 f
90 *KEY 6 g
100 *KEY 7 h
110 *KEY 8 i
120 *KEY 9 j
130 PROCENV1
140 ENVELOPE2,1,0,0,0,1,1,1,0,-1,-2,-3,126,100
150 *FX 11,30
160 *FX 12,20
170 A$="ZSXDCVGBHNJM,L.;/:1Q2W3ER5T6Y7UI9O0P@+½-"
180 PRINT"THE THREE INSTRUMENT MODES, MUSIC PAGES AND OTHER SOUND
EFFECTS ARE CONTROLLED USING THE FUNCTION KEYS.  FOR DETAILS OF
THESE SEE PCW ISSUE(C)] in necessary no.]. IT IS ADVISABLE TO PUT
LABELS  OVER THE FUNCTION KEYS."
190 PRINT''"  THE PRESENT MODE IS SHOWN ABOVE"
200 PRINT''"  O.K. I'M READY FOR THE LIBERACE"
210 B$=INKEY$(0)
220 IF INKEY(-1) F=17:PROCSTOP:GOTO 150
230 IF B$="a" PROCNOISE1
240 IF B$="b" PROCNOISE2
250 IF B$="c" PROCNOISE3
260 IF B$="d" PROCNOISE4
270 IF B$="e" PROCENV1
280 IF B$="f" PROCENV2
290 IF B$="g" PROCENV3
300 IF B$="h" PROCTU1
310 IF B$="i" PROCTU2
320 IF B$="j" PROCTU3
330 F=INSTR(A$,B$)+1
340 IF B$="" OR F=1 THEN210 ELSE PROCSTOP
350 SOUND1,1,(F*4)-4,5
360 GOTO210
370 DEFPROCSTOP:*FX 15,0
380 ENDPROC
390 DEFPROCNOISE1:*FX 15,5
400 SOUND0,2,4,10:ENDPROC
410 DEFPROCNOISE2:*FX 15,5
420 SOUND0,2,5,10:ENDPROC
430 DEFPROCNOISE3:*FX 15,5
440 SOUND0,2,6,10:ENDPROC
450 DEFPROCNOISE4:*FX 15,5
460 SOUND0,2,3,10:ENDPROC
470 DEF PROCENV2:PRINTTAB(12,1);"XYLOPHONE MODE":ENVELOPE1,1,0,0,0,
1,1,1,-5,-10,-15,-20,126,100:ENDPROC
480 DEFPROCENV1:PRINTTAB(12,1);"PIANO MODE      ":ENVELOPE1,1,0,0,0,
1,1,1,-1,-3,-1,-1,120,100:ENDPROC
490 DEFPROCENV3:PRINTTAB(12,1);"ORGAN MODE     "
500 ENVELOPE1,5,1,-1,1,1,1,1,-4,-12,-4,-4,120,100:ENDPROC
510 DEFPROCTU1
520 CLS:PRINTTAB(11,2);CHR$133;"SELECTION 1"
530 PRINTCHR$130;"1812"'" QRTYTRYT @ W E EQRTYTRTY R W @ D WTYTWEW
TWEWT @ @QRTRQ/QRQ/QR"
540 PRINTCHR$130;"MATCH OF THE DAY"'" QRTI TYYYT UITTTUQRTUTTTTT Y
UTRTYQRYIIIIII UIYUIO OP@@PO@IIOIUTTR"
550 PRINTCHR$130;"STAR WARS"'" QQQW   I  UYT@   I  UYT@   I  UYUT
(4 spaces)QQQW   I  UYT@   I  UYT@  IUYUI   QQQW UYTWRTTTYWEQQW U
(2 spaces)YTRITT  QQW U  YTRRTTYWEQQW U  YTRITT  QQW U  YTRRTYTWE Q
(1 space)QW))QW;+,Q"
560 PRINTCHR$130;"THE DAMBUSTERS THEME"'" I @ I I UYO I T   O Y Y TRR
(1 space)T R  TY O I  UY  YT  YRIO@P O I U I   @ I I UYU Y Y   O Y Y
(1 space)TRE T R  TY O I  UY Y T  TTRETR c o"
570 PRINTCHR$130;"THE BLUE DANUBE"'" ,,/QQ II TT ,,/QQ RR UU NN,NN OO
(1 space)UU NN,NN OO YY ,,/QR @@ II ,,/QR @@ OO ..NNN   ;QY   RQ/ .Y
                                           (1 space)QRaaa"
580 ENDPROC
590 DEFPROCTU2
600 CLS:PRINTTAB(11,2);CHR$133;"SELECTION 2"
610 PRINTCHR$130;"GREENSLEEVES"'" TU @@ POI YR TYU TTT RTY RW TU IO
(1 space)POI YR TYU TTSEST    T"
615 PRINTCHR$130;"ROBIN HOOD"'" RRR RRR YYYTR  'TTT TTT UUUTT   Y TRI
(3 spaces)O QU@   POI     OUT      YTR"
620 PRINTCHR$130;"WHEN THE SAINTS"'" RYUI     RYUI     RYUI Y R Y T
(4 spaces)UYTR  RT I IU   UYUI Y R T R"
630 PRINTCHR$130;"BLACK BEAUTY"'" QR   I     YUIUYTRW    U    TYUYTRTY
(3 spaces)I P @ P-@@P@   OP @ @"
640 PRINTCHR$130;"DOE A DEER"'" R  TT  RT R T    T  TUUYTU        Y UI
(2 spaces)YI Y I   U  IOOIUO       I  RTYUIO        O  TYUIOP      P
(2 spaces)TUIOP@     @PO     U    P    I    @RTYUIOP@ I P"
650 PRINTCHR$130;"SUPERCALIFRAGILISTICEXPIALODOCIOUS"'" 1111011111011
(1 space)U IIIIOIIIIIOII Y IIIIOII@@-@@ R @@POUIIOIUYTR R"
660 ENDPROC
670 DEFPROCTU3:CLS:PRINTTAB(11,2);CHR$133;"SELECTION 3"
680 PRINTCHR$130;"THE ENTERTAINER"'" T6T@ T@ T@      @-½-@-½- P- @
(4 spaces)T6T@ T@ T@      O]ROL -@O-     T6T@ T@ T@      @-½-R-- P- @
(4 spaces)@--@-- @-@-@-- @-@-@-- P-@"
690 PRINTCHR$130;"PUFF THE MAGIC DRAGON"'" @ @@ @ P   I I O   @ O I
(4 spaces)I U   I U Y I @ @ @ O P @-     @ @@ @ P   I I O   @ O I
(5 spaces)I U   I U Y I @ @ @ O P I @";
700 PRINTCHR$130;"BESIDE THE SEASIDE"'" IIO IYTRERI I   IIO IYTRERO
(5 spaces)OOPOPOP OIOIOIOIUYT O  YTTR"
710 PRINTCHR$130;"WORZEL GUMMIDGE"'" YUI - -@ PO IU  --@P  IU -@P OI
(1 space)UT  O I  YUI - -@ POIU -@ P IO   P @"
720 PRINTCHR$130;"THE WOMBLES"'" Q WR R WQ Q W RT   YU TT T TR T W RE
(3 spaces)Q WR R WQ Q W RT  YU TT T TR T W ER"
730 PRINTCHR$130;"HALLELUJAH"'" YIO I  OYI     IO@P I  @PIYI       IYO
(1 space)@ @@-@- YTRYUT  TRRR"
740 ENDPROC
```

Continued from page 13

unfair US version of Pontoon, 21 or Vingt-et-un, where you have to beat the dealer's hand, not merely equal it. *Craps* is the dice game so favoured in Western saloons and *Roulette* will take you and your wallet [illegible] Monte Carlo. The graphics on the first two games are good, although *Roulette* cheats a little by only showing the section of the wheel containing the ball.

All the games are well-written and appeared close to the originals in terms of the speed at which they emptied your pockets. Indeed, my innocent little Spectrum was the object of much abuse, accusations of cheating, etc, when this cassette was produced late one evening. After one run of particularly abysmal luck, I wondered if this cassette was not [illegible] fact financed by the Salvation Army as a demonstration of the pitfalls of gambling. If you are a financial masochist, this is obviously the tape for you.

The last section of Spectrum software comprises some of the utility programs available.

Character Programmer (ZedXtra Software) allows you to define your own 8 × 8 graphic characters on a large grid on the screen. It comes with clear, if mis-spelt documentation, as well as data to define invaders, tanks, aircraft, etc. Although it does a satisfactory job [illegible] defining and storing the new characters, I find it easier to scribble away on a piece of graph paper.

If you have to have a character generator program, then better value would be to acquire Altwasser's *Cambridge Colour Collection* which contains a similar program (plus 19 others) or Automata's *Character Generator* which also contains many different character sets ready programmed. Indeed, most Spectrum owners will by now be the proud possessors of Sinclair's apology cassette, *Horizons*, which contains an excellent character program.

Rushed finish

Picture Maker (JWV Software) is, quite frankly, a muddle. There is no documentation, and few instructions on screen. It is not mug-trapped at all, and frequently produces error messages even when the correct entry [illegible] made. From a glance at the listing, it could have had some potential, but shows clear signs of a rushed finish or the ZX Microfair. It is not in the same league as, say, *Green Warrior*, from the same firm.

The last utility program is *Superdraw* from Video Software. This has to be tremendous value. Five pounds will bring you an excellent high and low resolution drawing program, with circle, colour fill and large and small text options, a screen design pad, an easy-to-understand instruction booklet and a spoken commentary on the reverse of the tape.

To further demonstrate the potential of this program, there are several stored screen displays, including a detailed map of Southern England as well as a redefinable large character set. Any picture drawn with this program can be stored in your own programs — I wish all software houses offered such good value for money.

Machine Code

Ian Stewart and Robin Jones present a new series for beginners

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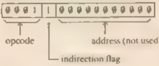
There are only two registers left to discuss, and both have similar functions — they can both alter the address part of an instruction while the program is running.

Indirection

Let us have a look at the I-register first. We will invent a new opcode, *Ldi* or "load indirect". Like *Hlt*, it doesn't have an address associated with it. To the machine, it's just like an *Ld* instruction except that the high bit of the address field is set to "1". This bit is called the *indirection flag*, and simply indicates to the computer that indirection is in force. So the binary form of the *Ldi* instruction is:



The hex code is 1800. When the computer encounters this instruction, it uses whatever number is in the I-register as the effective address. So if the I-register contains 1E4 and an *Ldi* instruction is executed, the effect is exactly the same as if the instruction had been *Ld* 1E4. In other words, the I-register acts as a memory pointer, and we can move it around to our heart's content if we can do arithmetic with it. That means moving values into the A-register, because that's the only place we can do arithmetic. So we'll invent an opcode *Xai* for "exchange contents of A-register with contents of I-register".

The indirection flag can be set for any instruction which has an address part. So we can have *Sti, Jpi, Addi* etc. and in each case, the last three digits of the hex code will be 800.

An example

Let's look at an example which uses these ideas. Suppose that we want to initialise a 1D array of length 20, to hold the numbers 2, 4, 6, 8 . . . 40. In other words we want a machine code equivalent of the Basic:

```
FORC = 1 TO 20
LETA (C) = C*2
NEXT C
```

There is a series of values which is going to have to be stored in memory somewhere, to make this work. They are 1 (because the loop count goes up in ones), 2 (because that's the increment for the array contents) and 20 (which is needed to test for the end of the loop).

For the moment, we do not want to be bothered with exactly where these numbers should be stored, so we are going to refer to these addresses temporarily by names (just like Basic names). We'll have to convert these to numbers when we finally get to machine code, of course. This [illegible] an application of Jones's First Law of Computing: "Never put off till tomorrow what you can put off till the day after."

So, we'll assume that the numbers we want are available in locations called N1, N2 and N20. Similarly, we'll have a location called *Base* which holds the address of the first element of the array, and one called *Count* which will act as the loop counter.

First, we set the I-register to point to the base of the array:

```
LD      BASE
XAI
```

Then we set the *Count* to 1:

```
LD      N1
ST      COUNT
```

Now we double this (by adding it back into the A-register) and store it in the location pointed at by the I-register. (We talk about "storing *through* the I-register" for short.)

```
ADD     COUNT
STI
```

We "undouble" the value on the A-register again, subtract 20 and see if the result is zero. If it is we've finished:

```
SUB     COUNT
SUB     N20
JPZ     OUT
```

Out is another, as yet unspecified, address. We don't know where it is yet, because we don't know where the program ends, and so, again, it's useful to give it a name temporarily.

If the branch doesn't occur, we add 1 to the *Count*:

```
LD      COUNT
ADD     N1
ST      COUNT
```

and increment the I-register by 1:

```
XAI
ADD     [illegible]
XAI
```

The current *Count* is now back in the A-register, so we can loop back to the doubling operation:

```
JP      LOOP
```

provided we give the "*Add Count*" instruction the symbolic address "*Loop*". Let's do this by preceding the instruction by its symbolic address followed by a colon:

```
LOOP: ADD COUNT
```

Reproduced from *Machine Code and better Basic*, by Ian Stewart and Robin Jones (price £7.50), by kind permission of Shiva Publishing Ltd, 4 Church Lane, Nantwich, Cheshire CW5 5RQ.

If you have any machine code subroutines/tips/games, please send them to: Machine Code, *Popular Computing Weekly*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

Peek & poke

Peek your problems to our address. Ian Beardsmore will poke back an answer.

COMMAND PERFORMANCE

Howard Roberts of Stockport, Cheshire, writes:

Q We have just got our BBC model B. I would like to know if there is a way of disabling the *Break* key.

A This is done by the command:

```
*KEY 10 ".     "
```

where the instruction you want up on the screen when you press *Break* is between the inverted commas. This is most commonly used for restoring and running the program, which would take the form:

```
*KEY 10 " OLD || [illegible] RUN || M "
```

CALLING NAMES AT RANDOM

I McIntosh of the Cheviots, Oban, Scotland, writes:

Q I have just received my 48K Spectrum, after what seems like a long wait, and I am very pleased with it. I would like to use it to draw names at random. I do not need a lot of names, and it does not matter if they are repeated sometimes. I have tried splitting a string using *To* but that only gives me bits, not complete words. Can you help?

A This program should do the job. I have used a colon as the marker between each word, but other symbols could be used. If you have a really long list of names, you might find it convenient to break the A$ into several strings. Remember that once you have entered the string you must use *Goto* 30, or else you will wipe it out:

```
 10 DIM A$ (Total length of the string
    you want)
 20 INPUT A$
 30 LET Z= INT (RND * Last but one
    colon) + 1
 40 IF A$ (Z) = ":" THEN GOTO 100
 50 IF NOT A$ (Z) = ":" THEN GOTO
    30
100 LET Z = Z + 1
110 PRINT A$ (Z);
120 IF A$ (Z) = ":" THEN GOTO 200
130 IF NOT A$ (Z) = ":" THEN GOTO
    100
200 PRINT " ANOTHER GO? "
210 INPUT B$
220 IF B$ = "S" THEN STOP
230 PRINT
240 GOTO 30
```

Because I have used a *Dimension* for the string A$, it is possible to look at every member of that string. Each word is separated from the others by a colon. For example, you might start A$ off with:

```
":DAVID:IAN:RICHARD: . . ."
```

Line 30 selects a random number, which is checked to see if it is a colon. When a colon is found, the characters between that colon and the next are printed in a line. Remember when *Dimensioning* your string to allow space for the colons. Your *Rnd* number should be the last colon but one, as your string should start and end with a colon.

COMPUTER DECATHLON

Andrew Lennox of Tring, Hertfordshire, writes.

Q I have recently ordered a BBC Model B micro. Apart from hoping that I will not have to wait months and months, I would like to know if it will be possible to chain programs on it. I want to write a computer decathlon of short games where the player will have to go from game to game with no time for resting in between. The program must also *Run* as soon as it has *Loaded*. How do I do this?

A The command that you are looking for is *Chain* "filename". Another way round the problem would be to write the 10 programs as one, using 10 sub-routines. If the programs really are short, there should be enough memory available. It would also mean that you could keep a running score from routine to routine.

TRIAL AND ERROR

Raymond Connell, Stenhousemuir, Stirlingshire, Scotland, writes:

Q Could you please tell me how I can find out which chips are, or are not, working in my Sinclair 16K Ram pack? While trying out another power supply, because the Sinclair one could not handle my ZX81, Ram pack and Maplin keyboard, smoke appeared from the back of my Ram pack. Although everything works perfectly now, I found that I only have 13K of Ram left. I would like to replace the damaged ICs but do not know how to isolate the faulty chips.

As my ZX81 was in kit form, I use my own power supply. Could you recommend another one.

A I do not know any way of finding out which chips are faulty other than by trial and error. Replace each chip in turn until the culprit/s are found.

It would seem that the problem is not with one of the 4116s but with one of the support chips. Either part of the memory is not being addressed, or you have a failure in the *Refresh* signal somewhere. In practice, I'm afraid that it would be easier to buy a new Ram pack or make do with 13K.

As for the correct power supply, the one supplied by Sinclair is the obvious choice. Sinclair's earlier supplies were less than one amp, but the later ones are a little above one amp, which may be enough for your needs.

The one person I know who uses a kit-built ZX81 also built his own power supply which is just over two amps. I think your best option would be to ask your local electrical shop if they can recommend a supply.

DECISION TIME

S Dennison of Simmonds Way, Chelmsford, Essex, writes:

Q I have owned a ZX81 for four months. I am now thinking of buying a graphics Rom expansion both for games and because lower case letters would be helpful in other programs.

The Roms that I have seen advertised are by Kayde, DK-tronics, and Quicksilva. I want [illegible] buy one that is simple and preferably does not require any soldering.

I have already spent £25 on a Ram pack. I wonder if it would be better to sell my system and get a Spectrum instead.

A This is a decision that only you can make. But, you must keep in mind the number of user-defined graphics that you want. The Spectrum can only use 20 at once (A to U). While this should ordinarily be more than sufficient, every letter that you assign a graphics character to cannot then be used as a letter either in upper or lower case.

Any of the graphic Roms that you mention will increase the potential of your character font considerably. But, each time you power up you will have to program the definitions of each character, unless you store the definitions on tape and *Load* them as a separate program. However, the graphics 4K Rom from DK-tronics gives you about 450 extra 'ready made' characters.

Fitting the DK-tronics chips will mean soldering, though only three connections are involved. Quicksilva's User-Defined Graphics Chip can be fitted without soldering, if you use the QS motherboard or the QS connector.

FLIGHT PATH

Tim Deans, Mallowdale, Middlesbrough, Cleveland, writes:

Q I have been trying to write a Basic games program on my Vic20, but I am having problems with inputs. For example, a player is flying a plane on a level course. If he wishes to increase his height, he presses key 1. The computer checks for this with an *Input A*, and then *If A = 1 then . . .*

However, if the player does not *Input* a command the computer prints a prompt on the screen and waits for a command to be *Input*. How can I make an *Input* that will work only when a key is pressed and ignore it if a key is not pressed?

A By the very nature of the command *Input* it cannot be ignored. The instruction you need to look at is the *Get* command, which can create a similar effect. Try this short routine:

```
 10 GET A$
 20 IF A$ < "1" OR A$ > "2" THEN
    GOTO 300
 30 IF A$ = "1" THEN GOTO 100
 40 IF A$ = "2" THEN GOTO 200
100 PRINT "Aeroplane goes higher" :
    GOTO 10
200 PRINT "Aeroplane goes lower" :
    GOTO 10
300 PRINT "No change" : GOTO 10
```

I have put this into a loop, but you can break out of it easily enough. There could be more instructions at lines 100 and 200 as these would form the subroutines that actually move your aeroplane on the screen. In this example I have used *Goto* instead of *Gosub* because a "2" *Input* would *Return* you to the start of the next subroutine (100).

Classified

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MATTELL INTELLIVISION plus 8 cartridges, perfect condition, still boxed, 6 months old. £200 ono. Tel: Matlock (0629) 2990 after 4 pm.

EXPANDED ZX81 with keyboard, 32K Ram, graphics, Rom, all manuals, leads, PSV, £25 worth of software, £12 worth magazines. Price £99. Tel: Southport (0704) 27941 after 3 pm.

8K UK 101. Cased, 6502 machine code plus Basic. David Feldman. Tel: (0279) 37629.

ZX81 plus 16K plus I/O port and information and software. £75. Tel: Hornchurch 51987

NASCOM 1, 36K RAM basic graphics, various modifications, cased, complete and working, unwanted system, £100 ono. Tel: (07782) 5525 any time

ATARI video computer game complete with COMBAT cartridge, used once and still under guarantee, £70. Tel: (0322) 862643.

VIC20 COLOUR COMPUTER plus cassette deck and *Vic Revealed* by Nick Hampshire, good condition. £170 ono C. Guy, Luton 391725

VIC20 with cassette unit plus *Vic Revealed*, hardly used, £160 ono or swap for BBC printer or disc drive. Telephone 090-567 444084.

ZX81 16K with video inverter, over 50 programmes and games, for professional, only £70. Phone 021-554 4393.

16K ZX81 with graphics toolkit and machine code games tape. Professional programmer able to give training to novice buyer. £65 ono 01-205 7530.

SUPERBOARD 3, 8K RAM 5 volt, 5 amp PSU modulator/case, segmon plus new basic 1, 3, 4, 5 Manual plus games, £170 ono. Tel: 01-204 4368.

UK101 — 8K RAM, cased, Mono 2, P59, toolkit, joysticks, mini EProm board, lots of software. £280 Tel Bradford 0274 727 635

SPECTRUM 48/K, brand new, box unopened, why wait. Best offer gets immediate delivery 01-367 2923 (eves or w/ends).

VIC20, under guarantee, cassette, joystick, programmers ref guide, intro to basic, software, mags, worth £450, £350 ono Tel 0253 592521 — after 5 pm (will sell separately if required).

16K ZX81 KEMPSTON KEYBOARD, magazines, £30 software inc 3D Defender Group Galaxians Scramble, excellent condition, £85 ono Tel 094-6 810972 (eves)

ZX81 16K RAM PAC. (Tel 288-0193 between 4 pm-5.15 pm only)

ZX81 with 16K RAM PAC plus software, £75. Mr A Butt. Tel: 01-921 6627 (days); 01-743 5169 (evenings)

TRS80, model 1, level 11, 16K, VDU, cassette, manuals, £220 ono Telephone 0923 43613 (evenings).

VIDEO GENIE, 16K with extra keys VV meter and sound, including software (assembler, disassembler, games etc) and some mags, current price new £400, sell for £250 ono 01-946 1429

ZX81, 1K, Sinclair built, very good condition, plus books and magazines worth £70. Yours for £40. Contact Peter Galvin 0582 30170 after 4.30 pm. 301 Hitchin Road, Luton.

ATARI 800 AT 48K single disc drive, tape drive £300 of software, including micro soft Basic, £800 ono. 10 months old. Tel: 572 2917.

SPECTRUM 16K, £110, ZX printer with 5 rolls of paper £50: Atari games computer with 7 cartridges including Pacman £200 Wellington, Somerset. Tel: 0823 47 2280

VIC20, cassette deck, Avengers cartridge, + cassettes games, 10 months, £180 ono. C. W. Brett, Litchfield 05432 28197

VIC20, cassette deck, Blitz cassette, four cartridges, Superlander, Ratrace, Pacman, Alien, complete with joystick £200 ono. Tel: 01-346 0243 anytime. (Mark).

VIC20 CASSETTE DECK, 3K RAM, 3 games cartridges (Alien, Super Lander, Avenger), power supply and leads for £220. Ring Mike Taylor, 01-242 4433 ext 4031 days or Gravesend 873875 eves.

VIDEO GENIE EG 3003, 16K + extra keys + sound box, built-in cassette deck, £300 ono Dave Milburn, Bristol (0272) 686685 (messages).

RADIO CONTROL playing and car + gear will swap for Vic or £180. Tel: Bradford 573038

ACORN ATOM with 12K RAM + 12K ROM (inc floating point ROM), manuals, cables + £80 software, £110. Tel 01-959 8499.

TRS-80 POCKET COMPUTER, Printer, Software, cost £180, excellent condition with original packing Offers please Murray-Shelley, Newtown, Llantwit (0443) 202627

VIC20 with 3K High Res Cartridge + cassette deck, Vic Revealed book, programs, reference guide + games, £230 Tel 0703 775660

SUPERBOARD II, 8K RAM, power supply, PSU and modulator, Wemon chip, documentation, games, software, £80 ono Tel Penrith (0768) 66712 after 5 pm

16K ZX81 SINCLAIR, various software, £65 Tel: Bognor 823351

SUPERBOARD, 24K RAM, 14K Basic, £70 of software, cased, power supply, screen enhancement kit, £275 ono Telephone St Albans 34566 after 8 pm.

ATARI TV GAMES SYSTEM with Combat cartridge, £50 ono. Tel Southampton (0703) 551046

SINCLAIR ZX81 16K for sale, £60. Steven Calder, 22 Woodland Park Road, Leeds LS6 2AZ Tel. 0534 756254

MATTEL INTELIVISION GAME SYSTEM, perfect condition, Soccer, Basketball, Skiing, Tennis + Star Battle cartridges. £160 Tel: 0760 337823, Mr Worthy

ZX80, added an 8K ROM + 16K RAM, slow modulator, to a full ZX81 specification, also software + books, all for £60 (buyer collects). Tel David (0438) 53757 after 5.30 pm.

COLOUR COMPUTER VIC20, still under guarantee with Data Set + 8K high rev super expander, software includes Pac Ram, Invaders, Astroids + Myriad. £250 ono Tel Medway 360847

VIC20, cassette, joystick, super expander, games tapes, less than 9 months old, excellent condition, bargain at £230 Tel: Southend-on-Sea 205 635 evenings only. Mr Green

VIC20, £145, new, boxed, with guarantee card Tel: 01-397 0798

SINCLAIR BUILT ZX81, Kempston keyboard and video inverter with PSU leads + manual, £65. Tel: 0203 346848 after 4 pm.

VIC20 COMPUTER with Arfon expansion board, 8K Ram, machine code monitor, programers aid, hi-res cartridge, plus tapes and books, £250 Tel: 01-954 4173 evenings.

ZX81 + RAMPAC + printer + £50 worth of software, £90 wanted. Tel: 01-794 0198.

LOTS OF SOFTWARE including Monster Maze, Adventure Tape 1 and Gulp, comes complete with manual + lead, £80. Tel: 0268 21465.

ACORN ATOM, 12K plus floating point, power supply and screen, £160 ono Alan Harding, Orpington 31744 (evenings).

VIDEO GENIE EG3003 COMPUTER, 16K Ram built-in cassette, sound modification fitted Worth £170 ono. Tel (0952) 595959.

ZX81 16K RAM, with good software, £50 Tel: Watford 37919 after 4 pm.

ZX81, 16K with over £100 of software, worth £200. But will accept £120. Tel: 01-882 5919, 5 pm to 7 pm.

TRS-80, MODEL 2, Level II, 16K, collection of games tapes, 18 months, £175 ono, must sell. Nick, anytime: 01-318 5009.

VIDEO-GENIE EG 3003, as new, with manuals and over £40 books and tapes. £150 Tel: Bedworth (0203) 314079, Mr Harcourt, 59 Longstreet, Bulkington, Nuneaton.

ATARI VCS with 8 cartridges (Combat, Space Invaders, Dodgem, Superman, Circus Atari, Asteroids, Basketball and Pacman), £170 ono. Phone, after 5 pm. 01-592 7048.

VIC20 plus CN1 cassette machine plus super expander with 3K and Vic revealed, £195 ono. Tel: 08954 43651

SPECTRUM my new 48K computer is advised delivery 1 week November, now too late. Avoid 12 weeks queue, Tel. Smith (0629) 56771

16K ZX SPECTRUM, 1 month old, with many arcades and other games, including all manuals, leads, power supply and free sound amp, only £140. Tel. 01-272 3319 evenings.

ZX81 with 16K Rampac and cassette, 9 months old, excellent condition, £60. Tel: 872 5768.

ACORN ATOM, 7K Ram, 8K Rom, few games, worth £165, yours for £175 ono Richard Wild, Crayford (2) 526736 evenings

TRS-80. Model I, Level II, 16K Ram, numeric keypad, 9 months old, some games software, £100 only. J Folcler, Southampton (0703) 464186 after 6 pm

16K ZX81 with magazine, £50. Leek (0538) 385387

ZX81 1K with software and joystick, £35. Tel Preston (0772) 717607

16K SPECTRUM plus ZX Printer, 2 months old, as new, also a few programs on tape, £129 ono. Tel: Bristol 676322

VIC20 plus 16K plus £300 of software (including top games), value £530, want only £300 Tel: 01-888 0510 after 6 pm

ATARI VCS plus £200 of software for sale, £140 ono Tel: Norwich 712320 after 6 pm

ATOM 12K via PSU leads, manuals, books, magazines and quality software, £120 ono. Tel: Garland, Plymouth 263276.

ZX81 16K plus software, only £55. Tel: 021-705 6944 after 3.30 pm.

SHARP PC1211 with printer, interface and software, batteries, ribbon, paper, etc., boxed, £80 ono. Tel: Smallfield (034 284) 2819, after 6 pm

ZX81 WITH 16K RAM, still under guarantee, with Dictator and Star Trail cassettes, dozen different mags and green glare screen, £80 Imran Haq, 01-902 8156.

WANTED, VIC20, with cassette deck and memory expansion if possible Offers to Mr M Peacock, 9 Claremont Avenue, Hersham, Walton-on-Thames, Surrey.

Sinclair ZX Spectr

16K or 48K RAM... full-size moving-key keyboard... colour and sound... high-resolution graphics...

From only £125!

First, there was the world-beating Sinclair ZX80. The first personal computer for under £100.

Then, the ZX81. With up to 16K RAM available, and the ZX Printer. Giving more power and more flexibility. Together, they've sold over 500,000 so far, to make Sinclair world leaders in personal computing. And the ZX81 remains the ideal low-cost introduction to computing.

Now there's the ZX Spectrum! With up to 48K of RAM. A full-size moving-key keyboard. Vivid colour and sound. High-resolution graphics. And a low price that's unrivalled.

Professional power–personal computer price!

The ZX Spectrum incorporates all the proven features of the ZX81. But its new 16K BASIC ROM dramatically increases your computing power.

You have access to a range of 8 colours for foreground, background and border, together with a sound generator and high-resolution graphics.

You have the facility to support separate data files.

You have a choice of storage capacities (governed by the amount of RAM). 16K of RAM (which you can uprate later to 48K of RAM) or a massive 48K of RAM.

Yet the price of the Spectrum 16K is an amazing £125! Even the popular 48K version costs only £175!

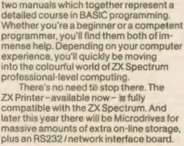
You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

Ready to use today, easy to expand tomorrow

Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

There's no need to stop there. The ZX Printer – available now – is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232/network interface board.



Key features of the Sinclair ZX Spectrum

- Full colour – 8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound – BEEP command with variable pitch and duration.
- Massive RAM – 16K or 48K.
- Full-size moving-key keyboard – all keys at normal typewriter pitch, with repeat facility on each key.
- High-resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.
- ASCII character set – with upper- and lower-case characters.
- Teletext-compatible – user software can generate 40 characters per line or other settings.
- High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files.
- Sinclair 16K extended BASIC – incorporating unique 'one-touch' keyword entry, syntax check, and report codes.

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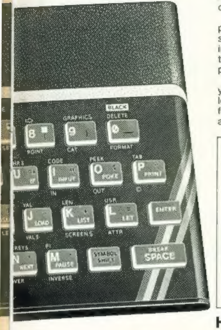

The ZX Printer – available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of five rolls.

The ZX Microdrive – coming soon

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing.

Each Microdrive is capable of holding up to 100K bytes using a single interchangeable microfloppy.

The transfer rate is 16K bytes per second, with average access time of 3.5 seconds. And you'll be able to connect up to 8 ZX Microdrives to your ZX Spectrum.

All the BASIC commands required for the Microdrives are included on the Spectrum.

A remarkable breakthrough at a remarkable price. The Microdrives are available later this year, for around £50.

RS232/network interface board

This interface, available later this year, will enable you to connect your ZX Spectrum to a whole host of printers, terminals and other computers.

The potential is enormous. And the astonishingly low price of only £20 is possible only because the operating systems are already designed into the ROM.

ZX Spectrum

Available only by mail order and only from

sinclair

Sinclair Research Ltd,
Stanhope Road, Camberley,
Surrey, GU15 3PS.
Tel: Camberley (0276) 685311

How to order your ZX Spectrum

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day. BY FREEPOST – use the no-stamp needed coupon below. You can pay by cheque, postal order, Access, Barclaycard or Trustcard.

EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR.

Qty	**Item**	**Code**	**Item Price £**	**Order Total £**
	Sinclair ZX Spectrum – 16K RAM version	100	125.00	
	Sinclair ZX Spectrum – 48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
	Postage and packing: orders under £100	28	2.95	
	orders over £100	29	4.95	
			Total £	

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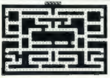
FREEPOST – no stamp needed. Prices apply to UK only. Export prices on application.

SF GOBBLERS

PUCKMAN FOR 16K ZX81



BEAT THAT HIGH SCORE! GOBBLE THOSE DOTS BEFORE THOSE MEANIES GOBBLE YOU! YOUR ONLY AIDES ARE FOUR "POWER PILLS" WHICH MAKE THE MEANIES EDIBLE. BUT NOT FOR LONG!

- MACHINE CODED FOR FAST ACTION
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- ON SCREEN SCORING
- HIGH SCORE WITH "ENTER NAME" FACILITY
- UP TO 4 PLAYERS

AN ANNOYINGLY FRUSTRATING GAME! FOR ONLY £5.95

SF ASTEROIDS

FOR 16K ZX81

STAY ALIVE AS LONG AS POSSIBLE IN OPEN SPACE FILLED WITH FLYING ROCKS. SCORE BY SHOOTING THEM – WHICH ALSO CAUSES THEM TO BREAK INTO LOTS OF LITTLE BITS AND MAKES LIFE EVEN WORSE!

- MACHINE CODED FOR FAST ACTION
- ON SCREEN SCORING
- HIGH SCORE WITH 'ENTER NAME' FACILITY
- UP TO 4 PLAYERS
- EXTRA SHIP FOR 1,000 PTS (NOT AS EASY AS IT SOUNDS!)
- SHIP MOVES JUST LIKE ARCADE VERSION
- ROTATE LEFT/ROTATE RIGHT/THRUST
- FIRES IN ALL 8 DIRECTIONS
- INCREASING NUMBER OF ASTEROIDS
- THREE ASTEROID SIZES
- 'NASTY' ALIEN SPACE SHIP (FIRES BACK!)

THIS GAME IS JUST AS BAD! – AND ONLY £5.95

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ZX81 16K GULP II Spectacular arcade game of the xxxMAN variety. "The best ZX81 game I have ever played" says John Fox of Osset W. Yorks — and so say many others. Entertains even just in demo mode. £4.75

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Spectrum SPDE Disassembler and Editor, fast self-relocating development tool. Shows all Z80 op codes and operands. £5.95. We used it to make . . .

Spectrum GULPMAN: this is GULP II plus colour and sound and is already a favourite for Spectrum. £5.95

Spectrum 48K MASTERFILE — the long asked-for equivalent to THE FAST ONE, with even more features which include separate files and full menu-driven report building. Almost total machine code. Yes, we will support the microdrive when they arrive. With full documentation and sample file, £15.00

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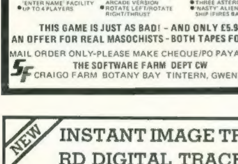
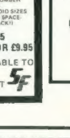
NEW

INSTANT IMAGE TRANSFER TO ZX SPECTRUM

RD DIGITAL TRACER £49.95





(unretouched originals)

The high resolution colour graphics of The ZX Spectrum permit accurate presentation of complex or irregular images – maps, technical drawings, even personalities. But entering individual co-ordinates for unusual shapes can be tedious and time-consuming.

The new RD DIGITAL TRACER cuts out much tedious plotting. It provides instant transfer from original to display file – for screen display in colour, ZX printer printout, or retention on cassette.

The RD DIGITAL TRACER is of immense benefit in many fields – for geographers and weathermen, for engineers, architects and technicians, even for budding Leonardos! Designed for use with the ZX Spectrum, the RD DIGITAL TRACER as supplied is compatible with ZX 81, although high-resolution colour graphics cannot be obtained on this machine.

The RD DIGITAL TRACER is available only from RD Laboratories. The price of £49.95 includes P & P and VAT. Send your cheque now for delivery in 28 days. (Cheques payable to "RD Laboratories".) The RD DIGITAL TRACER is supplied with tracing sheet, software cassette, and full instructions on use.

Please send me .... RD DIGITAL TRACER(S) at £49.95 each. I enclose payment of £ ________ . ____

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RD Laboratories' policy is to bring sophisticated computer techniques to low-cost computing. RD Laboratories therefore maintain the right to amend specifications at short notice. Please send for further details of the RD DIGITAL TRACER, and the RD 8100 SYSTEM for automatic monitoring, test and control.

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